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2002

EPA Superfund
Record of Decision:

KIM-STAN LANDFILL
EPA ID: VAD077923449
OU 01
SELMA, VA
09/27/2002

RECORD OF DECISION
KIM STAN LANDFILL SUPERFUND SITE

DECLARATION

I. SITE NAME AND LOCATION

Kim Stan Landfill Superfund Site
Selma, Alleghany County, Virginia
CERCLIS Identification No. VAD077923449

II. STATEMENT OF BASIS AND PURPOSE

This decision document presents the selected remedial action for the Kim Stan Landfill Superfund Site ("Site") located in Selma, Alleghany County, Virginia, developed and chosen in accordance with the Comprehensive Environmental Response, Compensation, and Liability Act of 1980, as amended ("CERCLA"), 42 U.S.C. §§ 9601 et seq., and to the extent practicable, the National Oil and Hazardous Substances Pollution Contingency Plan ("NCP"), 40 C.F.R. Part 300. This decision is based on the Administrative Record for this Site which can be found at the EPA Region III Docket Room in Philadelphia, Pennsylvania; the Clifton Forge Public Library in Clifton Forge, Virginia; and electronically at http://www.epa.gov/arweb.

The Commonwealth of Virginia has concurred with the selected remedy (see attached letter).

III. ASSESSMENT OF THE SITE

The response action selected in this Record of Decision is necessary to protect the public health or welfare or the environment from actual or threatened releases of hazardous substances into the environment from the Kim Stan Landfill Superfund Site.

IV. DESCRIPTION OF THE REMEDY

The selected remedy will reduce, to acceptable levels, risks to human health and the environment presented by the Kim Stan Landfill Superfund Site by covering the landfill to minimize the production of landfill leachate; collecting, removing, and treating landfill leachate at an off-Site treatment plant; and implementing controls to prevent use of contaminated groundwater. The selected remedy includes the following components:

- Consolidation of landfill wastes visible at the surface outside the landfill property boundary into the landfill;

- Installation of a leachate collection system (trench and barrier wall) which shall prevent the migration of leachate from the landfill property and contain such leachate within the landfill property boundary in a manner that will allow for removal and treatment of the leachate at an off-Site facility.

- Installation of piping and associated equipment to convey the collected leachate to the Low Moor Waste Water Treatment Plant ("LMWWTP") for treatment.

- Performance of upgrades to the LMWWTP to facilitate adequate treatment of collected landfill leachate.

- Conveyance of collected landfill leachate to the LMWWTP and treatment of the leachate.

- Installation of a multi-layer cap atop the landfill that shall reduce, to the maximum extent practicable, the infiltration of water into the waste and the resulting production of leachate and groundwater contamination.

- Routine monitoring of groundwater to document progress in meeting the groundwater performance standards and to determine the need for continued limits on groundwater use.

- Implementation of institutional controls to protect the integrity of the multi-layer cover, leachate collection system, and other remedy components on the Kim Stan Landfill property, and to prevent use of contaminated groundwater until the performance standards are achieved.

This selected remedy is intended to be the final response action for the Site.

V. STATUTORY DETERMINATIONS

The selected remedy is protective of human health and the environment; complies with all Federal and State requirements, standards, criteria, and limitations that are applicable or relevant and appropriate; is cost effective; and utilizes permanent solutions and alternative treatment technologies or resource recovery technologies to the maximum extent practicable. The selected remedy also satisfies the preference for treatment as a principal element (i.e., it reduces the toxicity, mobility, or volume of hazardous substances as a principal element through treatment).

Because this remedy will result in hazardous substances, pollutants, or contaminants remaining on-Site above levels that allow for unlimited use and unrestricted exposure, a statutory review will be conducted no less often than every five years after initiation of remedial action in accordance with Section 121(c) of CERCLA, 42 U.S.C. § 962 l(c), to ensure that the remedy is, or will be, protective of human health and the environment.

VI. DATA CERTIFICATION CHECKLIST

The following information is included in the Decision Summary section of this Record of Decision. Additional information can be found in the Administrative Record file for this Site.

- Chemicals of concern and their respective concentrations;

- Baseline risk represented by the chemicals of concern;

- Cleanup levels established for chemicals of concern and the basis of the levels;

- Current and reasonably anticipated future land use assumptions and current and potential future beneficial uses of ground water used in the baseline risk assessment and ROD;

- Potential land and groundwater use that will be available at the Site as a result of the selected remedy;

- Estimated capital, annual operation and maintenance (O&M), and total present worth costs; discount rate; and the number of years over which the remedy cost estimates are projected; and

- Key factor(s) that led to selecting the remedy.

VII. AUTHORIZING SIGNATURE

_______________________________ 9/27/02
Abraham Ferdas, Director Date
Hazardous Site Cleanup Division
EPA Region III

COMMONWEALTH *of* VIRGINIA

DEPARTMENT OF ENVIRONMENTAL QUALITY

W. Tayloe Murphy, Jr.
Secretary of Natural Resources

Street address: 629 East Main Street, Richmond, Virginia 23219
Mailing address: P.O. Box 10009, Richmond, Virginia 23240
Fax (804) 698-4500 TDD (804) 698-4021
www.deq.state.va.us

Robert G. Burnley
Director

(804) 698-4000
1-800-592-5482

September 27, 2002

Mr. Abraham Ferdas, Division Director
Hazardous Site Cleanup Division (3HS00)
U.S. Environmental Protection Agency, Region III
1650 Arch Street
Philadelphia, PA 19103-2029

Re: Record of Decision the Kim Stan Landfill in Alleghany County, VA

Dear Mr. Ferdas:

The Virginia Department of Environmental Quality staff has reviewed the Record of Decision (ROD) for the Kim Stan Landfill in the Town of Selma in Alleghany County, Virginia. We concur with the selected remedial alternative as outlined in the ROD dated September 2002.

Should you have any questions concerning this letter, please feel free to contact Dave Gillispie at (804) 698-4209.

Very truly yours,

Robert J. Weld
Director, Office of Remediation Programs

cc: Christian Matta, EPA Region III
Karen Jackson Sismour, VDEQ
Aziz Farahmand, VDEQ WCRO
Kevin Greene, VDEQ
Dave Gillispie, VDEQ

RECORD OF DECISION
KIM STAN LANDFILL SUPERFUND SITE

DECISION SUMMARY

I. SITE NAME, LOCATION, AND DESCRIPTION

This Record of Decision ("ROD") is issued by the United States Environmental Protection Agency ("EPA"), the lead agency for the Kim Stan Landfill Site under the National Oil and Hazardous Substances Pollution Contingency Plan ("NCP"), 40 C.F.R. Part 300, pursuant to the Comprehensive Environmental Response, Compensation, and Liability Act of 1980, as amended ("CERCLA"), in consultation with the Virginia Department of Environmental Quality ("VDEQ"), the support agency. This ROD is based on documents contained in the Administrative Record file for the Site.

A. Site Name and Location

The Kim Stan Landfill Site ("Site") is a former municipal/industrial solid waste landfill located on approximately 24 acres in Selma, Virginia, a small town located west of Clifton Forge, Alleghany County, Virginia (see Figures 1 and 2). The National Superfund database identification number for the Site is VAD077923449.

B. Site Description

The Site can generally be described as an elongated mound 50 to 85 feet above Route 696 with a relatively flat top that slopes from the side of the mountain to the south, northward to Route 696. Adjacent land use includes a sawmill to the east, a heavy equipment repair shop to the west, and to the north (across Route 696) an historic church and cemetery beyond which the CSX railroad yard expands to the east. The southern border of the landfill is the north slope of the forested Rich Patch Mountains, which is part of George Washington National Forest. Access to the landfill is limited by a 7-foot, chain-link fence topped with barbed-wire on the north and west side. The landfill may be entered through the sawmill property during business hours only.

No buildings are present at the landfill. Structures present include a stormwater pond outlet in the northeast corner of the property, and several 5-foot diameter, concrete sump or "manhole" features associated with an historic leachate collection and management system at the Site.

II. SITE HISTORY AND ENFORCEMENT ACTIVITY

A. Site History

The Kim Stan Landfill operated for almost twenty years. An estimated 860,000 tons of wastes were placed in the landfill between November 1972 and May 1990. Of this amount, 725,000 tons--consisting of out-of-state refuse collected primarily from commercial sources—-was buried in the landfill during the last 18 months of operation, at rates which approached 2,000 tons per day.

The original owners, Jack Kimberlain and H. R. Stancil, operated the landfill under permit No. 82 issued by the Virginia Department of Health. The Site was permitted to receive both municipal and industrial waste. In November 1972, landfill operations began with the disposal of municipal garbage and household debris. Most of the municipal waste that was accepted was from Alleghany County. Beginning in October 1978, the landfill accepted industrial waste on a limited basis.

In 1988, Shelcy Mullins, Sr., Jerry W. Wharton, William Stover, and James Taylor purchased the landfill and continued to operate it as the Kim Stan Landfill until May 1990. An estimated 725,000 tons of waste, which included large quantities of industrial waste, were received at the landfill between November 1988 and May 1990. By early 1990, the landfill had reached a height of 50 to 85 feet. The landfill was shut down by court order on May 11,1990, primarily due to outstanding operational problems.

B. State/Federal Activities

The Kim Stan Landfill began operation in November 1972 and initially accepted locally derived municipal and commercial refuse. In 1980, the Commonwealth of Virginia learned that approximately five thousand gallons of waste oil containing polychlorinated byphenyls ("PCBs") was disposed of at the landfill. As a result, the State Water Control Board collected seep and stream samples which tested positive for low levels of PCBs. A 1981 EPA Preliminary Assessment ("PA") concluded that further sampling of the surface water runoff was appropriate. A 1982 EPA Site Inspection ("SI") for which leachate and surface water were sampled concluded that impact to human health and the environment was not expected. The SI noted that negligible contamination was found in downstream off-Site drainage and river samples, but recommended that improvements be made in the Site drainage system.

The Kim Stan Landfill was sold in 1988 and resumed operations under new owners. Over the next two years, the seven day/week operation brought approximately 725,000 tons of additional wastes to the landfill. In 1989, a fish kill occurred in the Oxbow Ponds north of the CSX railyard. An investigation by the VDEQ did not identify the cause of the fishkill. In May 1990, the landfill was shut down under court order because of outstanding operational problems. At the time the landfill ceased operations, the granular cover soil over the landfilled material was less than six inches in thickness. From May 1990 through January 1993, the Virginia Department of Waste Management ("VDWM") and the Virginia Department of Transportation conducted various stabilization activities that included placement of 26,000 cubic yards of intermediate soil cover, installation of stormwater management and erosion control features, deactivation of the leachate pumping system, and off-Site disposal of an estimated 400,000 gallons of leachate.

In June 1991, the Virginia Department of Health, Bureau of Toxic Substances, performed a Preliminary Health Assessment for the Site. The report concluded that the Site posed an indeterminate public health threat, and recommended restricted public access and avoidance of on-Site/off-Site leachate and off-Site pond water, and called for the collection of various sediment, surface water, groundwater, and air samples. In May 1992, the EPA Region III Emergency Response Section performed a Site assessment that included the collection of leachate samples, a pond water sample, and a monitoring well sample. The results were submitted to the Agency for Toxic Substances and Disease Registry ("ATSDR") for review. ATSDR concluded that the leachate did not pose a threat to human health. No further action was considered at that time.

In January 1993, at the request of the VDWM, CH2M HILL commenced a comprehensive investigation at the Site, the findings of which were included in a 1993 report entitled "Ground Water Contamination Assessment and Required Final Closure Action." The study included the installation of wells, an extensive geologic and hydrogeologic assessment, landfill delineation, and an initial off-Site assessment.

In 1996, researchers from the Dabney Lancaster Community College published a report entitled "Possible Effects of Leachate from the Kim Stan Landfill on the Macro invertebrate Populations in the Jackson River and Unnamed Stream, Alleghany County, Va.." The report concluded that the waterway down gradient from the landfill Site, and possibly the Jackson River itself, had been adversely affected by the leachate.

In July 1997, a second EPA Site Inspection concluded that significant amounts of leachate, as well as contaminated groundwater and surface water runoff discharging from the Site, presented environmental concerns.

EPA proposed the Kim Stan Landfill Site for inclusion on the CERCLA National Priorities List ("NPL") on April 23, 1999, and added the Site to the NPL on July 22, 1999 (NPL status authorizes EPA to spend Superfund monies to implement remedial action at a site). In February 2000, EPA initiated a Remedial Investigation and Feasability Study ("RI/FS") which was completed in March 2002. The RI/FS identified the nature and extent of contamination, fate and transport of contaminants, and the risk posed by the Site to human and ecological receptors, and identified options to address the contamination found at the Site.

III. HIGHLIGHTS OF COMMUNITY PARTICIPATION

On July 24, 2002, pursuant to section 113(k)(2)(B) of CERCLA, 42 U.S.C. § 9613(k)(2)(B), EPA released for public comment the Proposed Remedial Action Plan ("Proposed Plan") setting forth EPA's preferred alternative for the Kim Stan Landfill Site. The Proposed Plan was based on documents contained in the Administrative Record file for the Site. EPA made these documents available to the public in the EPA Region III Docket Room in Philadelphia, Pennsylvania; the Clifton Forge Public Library in Clifton Forge, Virginia; and electronically at http://www.epa.gov/arweb. The notice of availability of these documents was published in The Roanoke Times and The Virginian Review on July 24, 2002. A public comment period was held from July 24, 2002 through August 23, 2002. In July 2002, EPA issued a fact sheet and published newspaper advertisements announcing the availability of the Proposed Plan and the date for the public meeting. EPA also notified the Kim Stan Advisory Committee of the date, time, and place of the public meeting. The July 2002 fact sheet discussed EPA's Preferred Alternative and solicited comments from all interested parties. On July 30, 2002, EPA conducted a public meeting during which Agency representatives answered questions about conditions at the Site and the remedial alternatives under consideration.

EPA received no comments during the public comment period other than those submitted during the July 30, 2002 public meeting. EPA's response to these comments is included in the Responsiveness Summary portion of this ROD.

Throughout the remedial process, EPA has worked in conjunction with the Kim Stan Advisory Committee (" Committee"), which consists of members of the local community and elected officials. The Committee reviewed, and provided comments on, documents such as the RI and FS under an EPA Technical Assistance Grant.

IV. SCOPE AND ROLE OF RESPONSE ACTION

The selected remedial action described in this ROD is intended to be the final response action for the Site. The selected remedy will eliminate unacceptable risks and hazards presented to both human health and the environment from contamination at the Site.

V. SUMMARY OF SITE CHARACTERISTICS AND EXTENT OF CONTAMINATION

Contaminants at the Site are attributable to past disposal and operational practices at the Kim Stan Landfill. Hazardous substances that were directly deposited into the landfill or released within the landfill waste mass have migrated vertically into the shallow groundwater or laterally with the leachate flow. The rate of migration has likely varied with the chemical-physical properties of the released contaminants. Upon entering the groundwater system, contaminants have been transported downgradient in groundwater. Contaminants in the leachate remained in the subsurface leachate pool or shallow groundwater or entered the surface water through leachate seeps. Once in the surface water, contaminants migrated to the surface soils around the leachate seeps and to the sediments within surface water bodies. Chemical data collected from the Site indicates that contaminants that have migrated to groundwater have been confined to the shallow groundwater in the vicinity of the northern edge of the landfill and the area of Route 696. Constituents that migrated to the leachate have been concentrated in the leachate pool located at the northern boundary of the landfill waste mass. Low concentrations of constituents have also been identified in the surface water sediments.

A. Site Characteristics

The Kim Stan Landfill occupies approximately 24 acres. Access to areas north of the landfill (i.e. , the wooded and wetland areas that contain the leachate seeps, small surface water drainages, and oxbow lakes) is not controlled; such areas are accessible via railroad access roadways, a parking lot for the Oakland Church (which is located across Route 696), and footpaths. Although the area is currently posted with no trespassing signs, the Oxbow Ponds have been used for fishing activities. Signs along Route 696 warn that water in the area is unsafe.

Covington, with a population of 4,679 (1990), and Clifton Forge, with a population of 6,991 (1990), are the closest towns to the Site. Future land use in the vicinity of the landfill is unknown, but is expected to be similar to the current land use.

No buildings are present at the landfill. Structures present include a stormwater pond outlet in the northeast comer of the property and several 5-foot concrete sump or "manhole" features associated with the leachate collection and management system (these were historically designated as leachate wet wells). These concrete sumps, which presumably were once at grade level, vary in height from 5 to 20 feet above the surface of the landfill as a result of subsequent landfill settlement. Two of these structures near Route 696 are reportedly connected to two 4000 gallon underground storage tanks. The western underground storage tank was located during the RI, but the location of the eastern tank could not be confirmed visually or with a metal detection device.

1. Topography

The topography of the landfill can generally be described as an elongated mound with a relatively flat top that slopes from the side of the mountain to the south, northward to Route 696. One distinct feature is a large bowl-shaped low area in the eastern part of the property. The highest point on the landfill is approximately 85 feet higher than Route 696; however, much of the landfill is 50 to 60 feet higher than the roadway. The bowl feature is about 30 feet deep and cannot be seen from the road.

The surface of the landfill and the east and west slopes are hummocky and swales have formed. Some small evergreen and deciduous trees are present, though the vegetation consists primarily of large shrubs and grass. A few vehicle paths cross the landfill surface, including the main "east-west" road that connected to the property to the east.

2. Surface Hydrology

The Kim Stan Landfill is located at the base of the north slope of the Rich Patch Mountains. The Jackson River is the largest surface water body in the vicinity of the Site, and it flows northeast through the area approximately 1000 feet north of the northern boundary of the landfill property. The river has historically migrated across its floodplain, leaving alluvial deposits and oxbow lakes throughout the area. Reportedly, the floodplain included northern portions of the area that is now landfill prior to the diversion of the river that occurred with the construction of the railyard and Interstate 64. Several small drainage basins on the north slope of the mountains historically discharged to the oxbow lake area. Now runoff from the small basin that includes the landfill and a few small drainage basins that encompass the town of Selma discharge to the oxbow lake area via culverts under Route 696 and the CSX railroad. One culvert discharges from the oxbow lakes to the Jackson River (see Figures 2).

Sources of surface water entering the landfill include percolation of precipitation and (formerly) flow from the Kim Stan Gully. Annual net precipitation in Alleghany County is 40.72 inches; a 2-year, 24-hour rainfall event will produce about 3 inches of precipitation (Weston, 1998). The Kim Stan Gully is an intermittent stream located south of the landfill on the slope of the Rich Patch Mountains. It is generally dry except during rain events. Prior to landfilling activities, surface water from the gully flowed north in two channels through the marsh associated with the Jackson River and its floodplain. Throughout the history of landfill operations, surface water from the south has been piped under and diverted around the landfill, though substantial amounts of water were not adequately captured and flowed into and through the landfill waste. Improvements to the surface water diversion system, located along the southeast and east sides of the landfill, were completed in Summer 2000 and were designed to eliminate surface water flow from the Kim Stan Gully into the landfill.

Currently, overland flow collects in three areas of the landfill—in swales on the landfill, in ditches along the property line to the west and along Route 696, and in the storm water pond along the northeast side of the landfill. All runoff from the landfill eventually discharges to the woods west of the church via culverts under Route 696. Observations made during June 2000 and February 2001 confirm that groundwater discharges to the streams located downgradient of the landfill.

Leachate seeps have been observed on the north slope of the Route 696 roadbed. The largest leachate seep is located in the western half of the undeveloped wooded area west of the Oakland Church and Cemetery. This seepage has been found to originate from a concrete sump associated with the former leachate collection system and has saturated a large area. Flow from this seep area forms rivulets that coalesce and discharge to a small stream in the wooded area.

Field observations confirm that this seep area consistently discharges several gallons per minute during all seasons, with the highest observed flow being 20 gallons per minute.

All ditches and small stream channels combine in the vicinity of the Oakland Church and the adjacent woods and flow through a single, centrally located culvert beneath the CSX railyard. The culvert is approximately 300 feet west of the northwest corner of the cemetery fence. The culvert discharges to a pond at the west end of the Oxbow Pond system. Surface water features in the Oxbow Pond area range from a very shallow cobble channel several feet wide to large open water areas with bottoms of fine sediment and water from a few to several feet in depth. Areas of saturated wetlands were observed in the Oxbow Pond area. In other areas, stream banks have been eroded to form two- to five- foot vertical faces that limit the formation of wetland areas. According to the National Wetlands Map for the area, the Oxbow Pond area is mapped as "PFOIA" (palustrine forested broad leaved deciduous, temporarily flooded); the intermittent stream areas immediately up- and downstream of the open water areas are mapped as "PUBF" (palustrine unconsolidated bottom, semipermanently flooded); and the eastern reach immediately prior to discharge to the Jackson River is mapped as "PEMIC" (palustrine emergent persistent, seasonally flooded).

A single culvert discharges from the eastern end of the Oxbow Pond area to the Jackson River. The elevation of this culvert is approximately equal to that of the Jackson River; river flood waters may therefore rise and enter the Oxbow Pond area. All of the homes and businesses in the immediate vicinity of the landfill are reportedly connected to the municipal sewer system. Consequently, sewage discharge from septic systems is not expected to contribute to surface water contamination in the area.

3. Hydrogeology

Both a shallow and deep aquifer exist in the vicinity of the Kim Stan landfill. The shallow aquifer displays thickness of up to 45 or 50 feet and consists of fill, alluvium, coarse alluvium, and colluvium. The deep aquifer consists of shale bedrock, which is believed to be Millboro Shale. In addition to the two Site aquifers, a perched leachate layer is present along the northernmost-portion of the landfill, adjacent to Route 696. This perched leachate is not considered a separate aquifer, but is a notable hydrogeologic feature.

The estimated permeability of the shallow aquifer based on rising head permeability tests ranged from 1.3 x 10-3 feet per second to 1 x 10-6 feet per second (or 4 x 10-2 cm/sec to 2.6 x 1O-4 cm/sec). The higher permeabilities were measured in the gravel/cobbles and granular alluvium, and the lower permeabilities were measured in the silty fine sand.

Based on six packer tests, the permeability of the near-surface shale varies from 6.25 x 10-7 to 3.14 x 10-5 feet per second (or 1.9 xlO-5 to 9.5 x 10-4 cm/sec). The highest permeability was noted from location TB-13 (22 to 32 feet below surface) and the lowest from TB-11 (50 to 60 feet below surface) (see Figure 3). The shale from the higher permeability zones contains very close to closely spaced fractures, with some steep fractures and slickensides, as well as increased amounts of mineralization by calcite and pyrite. The lower permeability zones in the shale display fractures which are more widely spaced and less steep with minor amounts of mineralization and slickensides.

Groundwater flow in the shallow and deep aquifers is generally in a northerly direction (some flow components are northeasterly and northwesterly), with flow between the aquifers displaying both downward and upward gradients (see Figure 4 for shallow groundwater flow and Figure 5 for deep groundwater flow). Horizontal gradients range from 0.016 to 0.166 in the shallow aquifer and from 0.029 to 0.082 in the deep aquifer. There are five sets of cluster wells which contain a shallow-screened aquifer well next to a deep-screened aquifer well in each set. The well clusters are as follows: MW01 and MW02, MW10S and MW10D, LW03S and LW03D, LW06S and LW06D, LW08S and LW08D, and MW11S and MW1 ID (see Figure 4).

Well clusters LW08 and LW03 displayed upward gradients between the shallow and deep aquifers during the November 2000, August 2000, January 2001, February 2001, March 2001, and May 2001 groundwater level measurement events. Well clusters MW01/ MW02 and MW11 displayed slightly downward gradients. The vertical gradient for well cluster MW10 displayed upward gradients in November and August 2000, and downward gradients in January, February, March, and May 2001. No gradient could be determined for well cluster LW06, as this cluster has been consistently dry since the start of water level measurement activities.

Interconnection between the shallow and deep aquifers at the Site appears to be limited. Most of the interconnection is probably related to bedrock fractures where gradients allow leakage either upward or downward through the fracture system. Although the shale is highly weathered near the interface between the aquifers, the shale itself is relatively impermeable (permeability of the bedrock interval in well MW-1 was found to be 1.1 x 10-7 cm/sec at a depth of 72 to 92 feet).

4. General Site Geology

Generally, the Site consists of four major geological units: fill, colluvium, alluvium, and shale bedrock. The units dip toward the north, with little to no alluvium or colluvium along the southern border; however, colluvium and alluvium near the northern border can be as thick as 10 and 30 feet, respectively. The fill unit consists of sandy silt, silty clay, or silty sand and varying amounts of sand, gravel, cobbles, waste, and organic material. The fill unit ranges in thickness from 0 to 20 feet, and is typically brown, black, or grey. Below the fill unit is colluvium, alluvium, or bedrock depending on location.

The colluvium unit consists of sandy silt, silty clay, and silty sand with varying amounts of sand, gravel, and cobbles. This unit was detected in test borings TB-4, TB-5, TB-8, TB-10, and TB-14, all but two of which are located along the northern border of the Site. Generally, the colluvium unit ranges in thickness from 5 to 20 feet, and is brown, grey, or reddish- brown. When present, the alluvium unit can reach thicknesses of 20 feet and consists of slightly sandy to sandy-clayey silt and silty clay which grades into coarser units such as very-sandy clay, clayey sand, silty sand, and gravel. The alluvium unit is typically brown to grey, but may also be black, tan, or reddish-brown. The shale bedrock unit, which may lie beneath the alluvium or fill, is generally weathered and fissile for the first 5 to 6 feet before becoming black and moderately hard. The shale may exhibit moderately to steeply angled fractures with slickensides and polished surfaces, as well as caleite-filled fractures with occasional pyrite. The shale is believed to be Millboro Shale, which is Middle Devonian in age.

The northern edge of the landfill has alluvium ranging in thickness from less than 10 feet near MW06 to over 40 feet near MW10, and coarse alluvium about 30 feet below grade over most of the area. The bedrock is typically 35 to 40 feet below grade, and may exhibit weathering within the first several feet. The alluvium appears to be about 30 feet thicker on the eastern side of the landfill near TB-10 and LW03, as compared to the western portion of the landfill near LW06 and LW01. There is no alluvium or colluvium present on the southern edge of the landfill. However, alluvium and colluvium are present at the far western portion of the Site near LW07.

A buried alluvial-filled tributary valley, the Kim Stan Gully, runs under the center of the landfill. This tributary valley, consisting of silty, gravelly sands, is about 100 feet wide and at least 12 feet deep at the southern edge of the Site and over 1,000 feet wide at the northern edge. It is believed that in the early 1800's, the main tributary split at the southern edge of the Site and traveled northeast, with one tributary passing near present-day monitoring well MW06 and the other near MW07. Generally, the buried alluvial-filled tributary valley grades downward into coarser material, with the lower 15 feet consisting of highly-permeable cobbles and gravel with fine sand.

Several faults have been mapped in the area. The two closest to the Site are less than 2 miles to the southwest. An additional fault, commonly referred to as the Covington-Clifton Forge fault, is reported to be in the area, though the exact location of this fault is not presently known.

5. Area of Archaeological Importance

The only known area of archaeological importance is the Oakland Church and Cemetery, located on the north side of Route 696. It is not anticipated that the selected remedy will directly impact the church property.

B. Nature and Extent of Contamination

EPA has developed an extensive amount of information detailing conditions at the Kim Stan Landfill Site. The majority of the analytical data was obtained during the 2000 Remedial Investigation ("RI"), during which the waste area was delineated; the existing landfill cover was evaluated; a landfill gas survey was conducted; surface water was evaluated; and landfill leachate, groundwater, and soil and sediment downgradient of the landfill property was assessed.

1. Waste Area Delineation

Waste area delineation activities were conducted in July 2000 to confirm the areal extent of landfill waste. The investigation included a test pit program at locations along the landfill perimeter. Test pits were excavated at intervals of 200 feet around the perimeter of the landfill. If waste was observed, test pits continued outward until no waste was encountered in the subsurface. Test pits were excavated until rock was encountered in the subsurface or until a depth of eight feet was reached. A total of 28 test pits were excavated and backfilled with the excavated materials (see Figure 6). The majority of the estimated 865,000 tons of waste is located within a fence surrounding the Site. Minor amounts of waste are located at a former waste unloading area east of the landfill and along the southern side of Route 696 along the landfill perimeter.

2. Existing Cover Assessment

An assessment was conducted to determine the thickness and characteristics of the existing landfill cover soil. The thickness of the existing landfill cover soil was determined by performing shallow test pit excavations. A total of 51 test pits were used to determine cover soil depth and to visually classify the soil to guide in selection of sampling locations. Test pits were located at intersections of a 150-foot grid system established over the landfill area.

The depth of cover soil at each test pit location was recorded and the cover soil was classified, using the Unified Soil Classification System ("USCS"), according to American Society for Testing and Materials ("ASTM") Method D2488. Samples of the existing cover soil were also collected from 10 representative locations across the landfill area for analysis of grain size (ASTM D 422), moisture content (ASTM D 2216), and Atterburg Limits (ASTM D 4318). Test pits and samples were named using their grid location as a station identifier. The cover soil sample locations and the 150- foot grid system are shown on Figure 7.

The existing cover soil ranges in thickness from 3 inches to 3.5 feet, with an average thickness of approximately 1.5 feet. There is no relationship between the current topography and depth of cover soil. Approximately 5.4 acres of the landfill has an existing soil cover thickness of less than 12 inches, and approximately 1 acre has an existing soil cover of less than 6 inches. Areas with a soil cover less than 12 inches are potentially susceptible to erosion which could expose the waste material.

3. Landfill Gas Survey

Methane was detected at 18 of the 38 probe locations at concentrations ranging from 2% to 52.2% (see Figure 8). Methane concentration contours depicted on Figure 8 reveal three main areas of elevated methane at the Site. Overall, the distribution of methane throughout the landfill is not considered to be anomalous.

With the exception of one localized methane concentration of 25%, detected in an area north of Route 696 in the vicinity of point F 14+ 50, methane in the shallow subsurface does not appear to extend beyond the landfill property. Additional probes installed on the north side of Route 696 revealed methane at 2.6% (north side of the road, identified as F14+ 50 (2) on Figure 8), and 0% (approximately 5 feet further north and down the road embankment slope, at F14+ 50 on Figure 8). Though it appears that methane may be migrating beneath Route 696, the methane quickly dissipates once it reaches the north side of the road.

Methane ("CH4"), carbon dioxide ("CO2"), and oxygen ("O2") screening results generally indicate an anaerobic environment within the landfill. This is evidenced by depleted levels of O2 at locations where elevated levels of CH4 and/ or CO2 were encountered. Results from several screening locations are anomalous, where low levels of CH4 were accompanied by elevated levels of CO2 and depleted levels of O2. Given the age of the landfill, elevated levels of methane in conditions containing elevated CO2 and depleted O2 concentrations are expected.

Landfill Gas ("LFG") also typically contains a small amount of non-methane organic compounds ("NMOCs") such as Volatile Organic Compounds ("VOCs"). VOCs were detected in 9 of the 38 probe locations at concentrations ranging from 0.1 to 23.7 ppm as measured with a photoinonization detector. The VOC detections were randomly distributed throughout the landfill. The highest detection was encountered at the far western border of the landfill property.

The estimated LFG emission rate for the landfill is 2 to 3 million cubic meters/year. It is estimated that immediately after the landfill stopped receiving waste, the LFG emission rate was 3.2 to 5.6 million cubic meters/year. The LFG emission rate will continue to decrease over the next 20 years. The total non-methane organic compound (NMOC) emission rate for the landfill is estimated to be 0.4 tons/year.

4. Surface Water and Sediment Evaluation

Surface water run-on from the mountains to the south has been diverted around the landfill by a drainage diversion project completed in 2000. Precipitation falling directly on the landfill flows downhill to ditches and catch basins and is piped under Route 696 through one of two culverts (one in the northwestern, and one in the northeastern portion of the landfill) to small waterways, which ultimately flow to the Oxbow Ponds and Jackson River.

A detailed assessment of the surface water quality was not necessary because of the decision to apply the presumptive remedy approach to this Site (see Section VIII (Remedial Action Objectives)). The sole surface water data collected during the 2000 RI were field measured water quality parameters. Surface water data collected from the July 1997 Site Inspection ("SI") are summarized below.

During the July 1997 SI, surface water samples were collected from 14 locations (a total of 15 samples, including one duplicate) and analyzed for TCL/TAL analytes, including total metals. Single low level detections of a variety of volatile and semivolatile compounds were noted. There were also widespread detections of heavy metals, with elevated concentrations of iron and manganese. The samples were collected from small streams in the area north (downgradient) of the landfill that have been historically impacted by leachate from the main leachate seep (LS01) (see Figure 9).

Sediment was collected as part of the RI field effort in June and July 2000. The scope of sediment sampling was partially based on the results of sediment samples collected previously at the Site during the July 1997 SI. The RI sediment data were intended to supplement the July 1997 data to delineate the quality of the sediment in the various waterways in the area. Sediment sample locations are shown on Figure 9.

The 2000 RI sediment sampling event included the collection of 44 sediment samples (including 5 duplicates). The samples were collected in areas downstream of the landfill in stream channels, seep areas, and floodplains, and at background locations in two areas (a stream immediately up gradient of the landfill and a tributary to Karnes Creek southwest of the Site). The July 1997 sediment sampling event included the collection of 15 sediment samples (including 1 duplicate) from locations throughout the study area. Several of the samples were collected in the Jackson River to evaluate the need for further sampling in the river.

The 2000 RI sediment samples were analyzed for TCL organics and TAL total metals, and cyanide using the Contract Laboratory Program, as well as for grain size and total organic carbon. The July 1997 sediment samples were analyzed for TCL/TAL constituents only. The 1997 SI and 2000 RI sediment sampling results reveal widespread detections of (low concentration) semi-volatile organic compounds and pesticides in the channel and seep sediments throughout the study area. Floodplain sediments (locations SD54 through SD57) showed the same general results (see Figure 9). In addition, there were single random low concentration detections (ranging from 2J ug/kg to 246 ug/kg) of various volatile organic compounds (see Tables 1, 2, and 3).

In general, the detections of polycyclic aromatic hydrocarbons ("PAHs") throughout the study area appear to be random with no trend observed (i.e., increasing or decreasing concentrations downstream or upstream). Higher concentrations of total PAHs were observed (as compared to all of the channel sediment station data) at channel sediment stations SD04 (located on a tributary which does not specifically drain the landfill area directly), SD05 (downstream from SD04), SD07 (downstream of the confluence with the stream that drains the main leachate seep LS01), and SD19, SD21, and SD22 (all of which are located on the southern bank of the lower Oxbow Pond). Relatively low concentrations of PAHs were detected in channel sediment sample SD06, collected in the vicinity of the main leachate seep LS01. Little to no PAHs were also detected in the reference background channel sediment sample locations SD24 and SD25, as well as the channel sediment sample collected from the Kim Stan Gully (SD01). The floodplain sediments generally contained less PAHs than the channel sediments.

Another semi-volatile compound of interest detected in landfill leachate as well as down gradient sediments is butylbenzylphthalate, which was detected at 7 of the stations, including the seep stations SD50 and SD51 (located near the main leachate seep), SD53 (located behind the cemetery) and floodplain sediment sample SD55 (located along the north side of the western Oxbow Pond).

Pesticide concentrations were also highly variable with no obvious concentration trends throughout the study area. Higher concentrations of pesticides (as compared to all of the sediment station data) were observed at stations SD19 (located on the Oxbow Pond), SD23 (located on the southern side of Route 696 on a dry stream segment draining Selma), SD15 (located on the southern bank of the western Oxbow Pond), and SD06 (located near the main leachate seep LS01). Elevated concentrations of pesticides were also observed in seep sediments SD50 (located near the main leachate seep LS01), SD53 (located behind the Oakland Church cemetery), and floodplain sediment sample SD56 (located in the Oxbow Pond area).

The highest total PAH concentrations were detected at locations SD19 and SD22, both in the shallow and deep sediment samples. It should be noted that these sample locations are adjacent to the railroad embankment, and numerous discarded railroad ties were observed on the embankment and in the Oxbow Pond area during low water conditions of May 2001 . These ties could be a potential sources of the PAH contamination found in these sediments.

The sediments collected in the Oxbow Ponds generally contain more total organic carbon ("TOC") than the sediments collected in the streams and background reference stations. This is expected as more organic material (e.g., leaves and sticks) were observed in the Oxbow Pond sediments than in those of the channel.

There were widespread detections of inorganic analytes at all channel and floodplain sediment sample locations. In general, the frequency and distribution of inorganics in the sediments are similar throughout the study area, with most analytes demonstrating little variability. A notable exception is the relatively high iron (224,000 mg/kg) and arsenic (79 mg/kg) detected in the SD06 sample, and iron (284,000 mg/kg) and arsenic (34 mg/kg) detected in the SD51 sample, both of which were taken near the main leachate seep LS01 (see Tables 1, 4, and 5).

A review of the grain size analyses data reveals a wide range of sediment types throughout the study area. In general, samples that contain higher amounts of silt and clay also contain higher concentrations of inorganic analytes, as the heavy metals tend to bind to the finer sediment fractions rather than the coarser fractions.

5. Leachate Assessment

Leachate quality at the Kim Stan Site was assessed using, among other things, the concrete leachate wet well data (LW01 and LW02), which are considered to be the most representative of leachate quality at the Site; leachate seep data (LS-1 through LS-5); and designated leachate well data (LW03 - LW08), derived from wells installed to investigate the presence, if any, of leachate in the first water-bearing units in the immediate vicinity of the landfill (see Figures 4 and 10).

Leachate is primarily discharging from the Site at a rate of 5 to 20 gallons per minute through an abandoned leachate sump located on the north side of Route 696. This sump is reportedly connected to the western landfill leachate wet well (LW01), which is ultimately connected to a leachate interception trench on the north side of the landfill as well as to an underdrain located under the landfill. An estimated 8 to 9 million gallons of leachate is generated at the landfill in an average year.

There are two concrete wells, historically known as LW01 and LW02, which were used as leachate collection points during landfill operations. These features are apparently interconnected with the leachate collection drain system underlying the Site, as well as connected to the leachate collection system installed along the northern boundary of the Site in 1989. LW01 is also reportedly connected to the abandoned sump located north of Route 696

The concrete leachate wells were sampled concurrently with the other seeps, leachate wells, and groundwater monitoring wells at the Site for identical parameters. The samples collected from these locations are considered raw landfill leachate. The concrete leachate well samples were analyzed for TCL organics and TAL total and dissolved metals, and cyanide using the Contract Laboratory Program, and for a number of other water quality parameters.

The samples from the concrete sumps are considered to be undiluted leachate, given their connection to the historic leachate collection system. Low levels of several VOCs (including chloroethane, benzene, and 1,4 dichlorobenzene), SVOCs, and pesticides were detected in the concrete sump wells during the four sampling events. Much of these data are J-qualified, indicating concentrations at or below the quantitation limit. One exception, however, was the detection of one unusual SVOC, n-nitrosodiphenylamine, which was detected in both locations LW01 and LW02 during the November 2000 event and the February and May 2001 sampling events at non-qualified concentrations. The concentrations of this SVOC remained relatively stable during the monitoring period, ranging in concentration from 14 to 37 ug/l.

Various metals were detected in the unfiltered samples collected from the concrete sump wells during the three sampling events. As expected for leachate samples, high concentrations of iron, manganese, and sodium are present, with barium also present at elevated concentrations (see Table 6).

Leachate seeps have been observed historically along the northern bank of Route 696, and were proposed to be sampled as part of the RI. The presence of the seeps appears to vary at any one location based on weather or season. Samples from two locations, LS01 and LS02, were collected from saturated ground at the foot of the north-facing embankment of Route 696. LS01 is downstream of the concrete leachate sump (designated LS05), and is also in proximity to the "midway seep discharge" referenced in the CH2M HILL report. LS02 does not appear to be situated near any channel or culverts, and is seasonally dry. Other previously saturated possible seep areas were dry at the time of the field events. Consequently, two additional seep samples (locations LS03 and LS04) were collected from locations associated with channels emanating from culverts under Route 696. However, the culverts were not discharging at the time the samples were collected. The water in these channels is therefore likely a combination of leachate discharging through the bottom of the road embankment (since the bottom of the road embankment on the north side of Route 696 is at the same approximate elevation as the bottom of the waste on the south side of the roadway) and discharging groundwater.

Samples were collected from four leachate seep locations during the August 2000 sampling event (LS01 through LS04), and only from three leachate seep locations during the November 2000 sampling event (LS01, LS03, and LS04; LS02 was dry during the this event)(see Figure 10). During the February 2001 sampling event, the leachate sump responsible for most of the discharge in the vicinity of LS01 was identified (and subsequently designated LS05) and sampled along with locations LS02, LS03, and LS04. During the May 2001 event, location LS-02 was dry, and samples were collected from locations LS01, LS03, LS04, and LS05.

The leachate seep samples were analyzed for TCL organics and TAL total and dissolved metals, and cyanide using the Contract Laboratory Program, and for a number of other water quality parameters.

With the exception of LS01 and LS05, the leachate seep samples contained little to no organic compounds. LS01 and LS05 contained a variety of low level VOCs (including benzene, chlorobenzene, 1,4 dichlorobenzene, and chloroethane), most of which are J- qualified (indicating the analytes are present at or near the quantitation limit). The VOCs detected in LS01 and LS05 were generally found at the same concentrations between the sample rounds. LS01 and LS05 also included an unusual SVOC, n-nitrosodiphenylamine, which was detected during all rounds (ranging from 6 to 9 ug/1). The low concentration VOCs detected in LS01 and LS05 are similar to those detected in raw leachate sample locations LW01/LW02. N-nitrosodiphenylamine was also detected at locations LW01/LW02 (at concentrations ranging from 25 to 35 ug/l). The chemical data further supports the connection between the concrete leachate sumps north and south of Route 696.

The concentration of metals at location LS01 and LS05 are generally different from all other seep locations, and are more like the concentrations detected in the raw leachate samples. Locations LS01 and LS05 typically had higher concentrations of iron, potassium, barium, and sodium, and lesser concentrations of manganese, lead, zinc, copper, and chromium than the other seep locations.

It should be noted that the data collected from locations LS02, LS03, and LS04 during certain sampling events are probably not considered to be representative of the actual water quality at those locations. Periodically, the samples collected at these locations were highly turbid, and the metals results provided for these locations are probably skewed because of the high suspended sediment content in the water. Consequently, high concentrations of zinc, manganese, arsenic, copper, and lead in these samples appear to be related to the suspended sediments and not dissolved analytes; these high concentrations are related to high TSS values, and are not reproduced in samples with low TSS values (see Table 7).

In general, the water quality parameter measurements in LS01/LS05 are quite different than those found in LS03 and LS04. This further supports the observation that the LS01/LS05 results are more like raw leachate results rather than results obtained for leachate-impacted groundwater (this observation is not surprising given that the LS01/LS05 samples were taken from the concrete leachate sump, which contains pure leachate). This also suggests that LS03 and LS04 appear not to have been impacted by leachate. This would support the notion that the discharge to the small streams is mostly from groundwater discharge rather than leachate discharge through the road embankment (see Table 8).

Eight leachate wells were installed and sampled during the RI. Well pairs screened in shallow and deep water-bearing zones are located at stations LW03, LW06, and LW08. All leachate well locations are presented on Figure 10. The leachate wells were installed at or near the edge of the landfill waste and were screened in the first and second (if applicable) water-bearing zones. The wells were sited in proximity to areas known to contain pooling leachate.

The leachate well samples were analyzed for TCL organics and TAL total and dissolved metals, and cyanide using the Contract Laboratory Program, and for a number of other water quality parameters.

Overall, little to no organic compounds were detected in any of the leachate well samples. Location LW03S is the only well that consistently contained VOCs during all sample rounds, with detections of benzene, 1,1 dichloroethane, chlorobenzene, and chloroethane, all at J-qualified concentrations. LW03S also contained the SVOC n-nitrosodiphenylamine at a concentration of 3 ug/l and 5 ug/l during the August 2000 and May 2001 sampling events, respectively. This is noted because this SVOC (as well as several of the VOCs) was also detected in samples collected from leachate sample locations LW01/LW02 and LS01/LS05.

A variety of inorganics was detected in the leachate monitoring wells. Analytes of interest include arsenic, barium, iron, and manganese, which are widespread throughout the area. Wells LW03S and LW08S exhibited the highest levels of iron and manganese, which is consistent with leachate contamination (see Table 9). The basic water quality parameter results from the leachate wells are provided in Table 10.

The raw leachate collected at the Kim Stan Site is a very weak/low strength leachate as compared to typical landfill leachate. The leachate contains low concentrations of various VOCs, SVOCs, pesticides, and heavy metals, but contains iron and manganese at relatively high concentrations, which is not unexpected for a leachate. One notable and unusual SVOC, n-nitrosodiphenylamine, was also detected in the leachate samples at concentrations ranging from 14 to 37 ug/l.

6. Groundwater Evaluation

Thirteen monitoring wells were sampled during the RI. Cluster wells screened in shallow and deep water-bearing zones are located at stations MW10 and MW11, as well as the MW01 (deep well) and MW02 (shallow well) pair. All monitoring well locations are shown on Figure 4.

The monitoring well samples were analyzed for TCL organics and TAL total and dissolved metals, and cyanide using the Contract Laboratory Program, and for a number of other water quality parameters intended to assess the presence of leachate.

Analytical results demonstrated that very few organic compounds were detected in the monitoring well samples. Notable detections include vinyl chloride in well MW04 (1J ug/l) during the August and November 2000 sampling events, and vinyl chloride in well MW06 (3 to 4J ug/l) during all sampling rounds. Well MW06 also included low levels of trichloroethene ("TCE")(1J ug/l) and cis 1,2-dichloroethene ("DCE")(2J ug/l) during the November 2000 sampling event, and DCE during the February and May 2001 events at 1 ug/l and 2 ug/l, respectively. Well MW04 also had a detection of DCE (1J ug/l) during the November 2000 event. These were the sole detections of these compounds in any aqueous sample collected for the RI, including samples from seeps and leachate wells.

Well MW10S also exhibited low levels of chloroethane (2J ug/l), chlorobenzene (2-4J ug/l), benzene (1-2J ug/l), fluorene (2J ug/l), and n-nitrosodiphenylamine (1J ug/l) during the various sampling events. Well MW10D also contained toluene (2J ug/l) and xylene (2J ug/l) during the November 2000 sampling event. Well MW08 contained low levels of phenol (4J ug/l) and diethylphthalate (2J ug/l) during the August 2000 sampling event.

Groundwater samples collected from the monitoring wells contained various inorganic analytes. Arsenic, barium, iron, manganese, and thallium were consistently detected during all sampling events.

In general, the concentrations of inorganic analytes were similar in all of the monitoring wells, with the iron and manganese data having the highest variability. High iron and manganese concentrations were detected in well MW10S during all sample rounds, at concentrations ranging from 29-72 mg/l (iron) and 27-36 mg/l (manganese). These levels are an order of magnitude or more above levels found at the other monitoring well locations. The high iron and manganese concentrations are probably related to leachate contamination in this area. Table 11 identifies the well location and analyte detections exceeding the Maximum Contamination Levels (" MCLs") established under the Safe Drinking Water Act.

It should be noted that there were analytical problems associated with the water quality parameter data collected from the November 2000 sampling event because of reported blank contamination, which has qualified the data. The remainder of the data are generally unqualified.

Based on a review of the water quality parameter data from the August 2000, February and May 2001 events, it appears that well MW10S has likely been impacted by leachate, as this well has positive detections of both BOD (up to 70 mg/l) and COD (up to 210 mg/l), as well as a TOC concentration (up to 21 mg/l) which is greater than any of the other monitoring wells.

Well MW05 also has low concentrations of BOD and COD and higher than average TOC concentrations (detected during the February 2001 sampling event), and also typically has high iron and barium concentrations similar to well MW10S. This indicates the potential for leachate impact at this well. The water quality parameters measured for the other monitoring wells appear to be generally similar.

A variety of potable wells were sampled during the RI to collect general water quality information for the area and to evaluate potential groundwater receptors. Given the proximity of these well locations to the Site (see Figure 11), and based on subsequent interpretation of groundwater flow direction information, only one well is located in a direction which could possibly be hydro logic ally downgradient of the landfill. This well, designated as DW01, which was initially identified during the SI, is located approximately ½ mile northwest of the landfill on a farm. The well is not in use as a drinking water well, but it is located near a garden, approximately 100 feet northeast of the farmhouse, and is reportedly used solely for irrigation of the garden. The well is constructed with a pump and faucet; no information is available regarding the depth, screened interval, etc. A sample and duplicate sample were collected from the well during the August 2000, November 2000, and May 2001 sampling events (the well was not operational during the February 2001 event). The station and the duplicate at this station are designated DW01 and DW02, respectively.

Five additional potable wells were identified in early 2001 and were subsequently sampled during the February and May 2001 sampling events to provide general water quality information. However, given that these wells are not hydrologically downgradient of the landfill, but rather are side-gradient or upgradient, they are not discussed in detail as they would not be impacted by the Site.

The potable well samples were analyzed for TCL organics and TAL total metals, and cyanide using the Contract Laboratory Program, and for a number of other water quality parameters intended to assess the presence of leachate. (Note that no supplemental water quality parameter analysis was conducted on the samples collected in February 2001 because of the limited number of stations sampled and scheduling constraints; these data were once again collected in May 2001, and consequently, no data gap exists).

The only organics detected in irrigation well DW01 during the three sampling events were low levels of pesticides including 4,4-DDD (0.0054J ug/l) and beta BHC (0.29J ug/l).

Various inorganic analytes were detected in the irrigation well. Notable detections include arsenic, barium, iron, and manganese at similar levels between the sampling rounds (see Tables 12).

7. Soil Evaluation

The surface soil downgradient of the landfill and in background areas contains a variety of low concentration polycyclic aromatic hydrocarbons ("PAHs"), pesticides, polychlorinated biphenyls ("PCBs"), and heavy metals. The detections appear to be randomly distributed throughout the study area, and the concentrations are generally similar. Therefore, historical runoff from the landfill has not resulted in higher concentrations of analytes in surface soil in downgradient areas beyond that otherwise present as a result of natural or man made sources (e.g., natural soil conditions, highway runoff, vehicle and locomotive emissions, and atmospheric deposition).

Similarly, the subsurface soil downgradient of the landfill and in background areas contains a variety of low concentration VOCs, PAHs, pesticides, PCBs, and metals. A statistical evaluation reveals that the concentrations in subsurface soils downgradient of the landfill are statistically the same as those detected at background locations. Therefore, historical runoff from the landfill has not resulted in higher concentrations of contaminants in downgradient sub-surface soils (see Figure 12 for off-Site surface and subsurface soil sampling locations).

VI. CURRENT AND POTENTIAL FUTURE LAND AND WATER USES

The landfill property is not currently being used for industrial, commercial, or residential purposes. Adjacent properties in the area are commercial/industrial and include a sawmill to the east, a heavy equipment repair shop to the west, and, to the north across Route 696, an historic church and cemetery beyond which the CSX railroad yard expands to the east. Undeveloped land to the south is part of the George Washington National Forest. Future use of the landfill property would have to be consistent with the institutional controls called for as part of the selected remedy to ensure that the future use of the property does not interfere with or adversely impact the multi-layer cap.

Residents in this area do not rely on groundwater as their source of drinking water. There are no residential properties downgradient of the landfill that would be impacted by the very limited amount of groundwater contamination that has migrated from the landfill property. Future use of groundwater in this area would be limited in accordance with the institutional controls which are part of the selected remedy.

VII. SUMMARY OF SITE RISKS

A. Human Health and Ecological Risks

The RI included analyses to estimate the human health and environmental hazards that could result if contamination at the Site is not cleaned up. These analyses are commonly referred to as Risk Assessments and identify existing and future risks that could occur if conditions at the Site do not change. The Baseline Human Health Risk Assessment ("BLRA") evaluated human health risks and the Ecological Risk Assessment ("ERA") evaluated environmental impacts from the Site.

The NCP established acceptable levels of carcinogenic risk for Superfund sites ranging from one excess cancer case per 10,000 people exposed to one excess cancer case per one million people exposed. This translates to a risk range of between one in 10,000 and one in one million additional cancer cases. Expressed as scientific notation, this risk range is between 1.0E-04 and 1.0E-06. Remedial action is generally warranted at a site when the calculated cancer risk level exceeds 1.0E-04.

The NCP also states that sites should not pose a health threat due to non-carcinogenic effects. EPA quantifies a non- carcinogenic threat by the ratio of the contaminant concentration at the site that a person may encounter to the established safe concentration. If the ratio, called the Hazard Index ("HI"), exceeds 1.0, there may be concern for the potential non- carcinogenic health effects associated with exposure to the chemical. The HI identifies the potential for the most sensitive individuals to be adversely affected by the noncarcinogenic effects of chemicals. As a rule, the greater the value of the HI above 1.0, the greater the level of concern.

The BLRA was performed to evaluate the potential risks to human health due to exposure to chemicals of potential concern in off-Site soils (surface and subsurface); channel and floodplain sediments, leachate; and groundwater associated with the Site. No attempt was made to differentiate between risk presented by other locations and risk associated exclusively with releases from the Kim-Stan Landfill Site. The human health risk assessment has been derived primarily from data collected during RI field activities in Summer and Fall 2000, supplemented by data from the 1997 Site Inspection ("SI") field event.

Because EPA opted to use the presumptive remedy approach in investigating this Site (see Section VIII (Remedial Action Objectives)), the Agency did not assess the risks to human health presented through exposure to air, soil on the landfill, surface water or sediments on the landfill, or ground-water on the landfill.

A baseline risk assessment was conducted to determine the need, if any, for remedial action. The assessment focused on the current and potential future exposure to soil, sediments, leachate, and surface water as well as potential future exposure to groundwater (no current groundwater exposure pathway exists at the Site).

The procedures used in scoping and performing the risk assessment were consistent with, and based on, EPA guidance and policies for performing such studies at Superfund sites.

This section of the ROD summarizes the results of the baseline human health risk assessment for the Kim Stan Landfill Site.

1. Human Health Risk Assessment

A. Identification of Chemicals of Concern

Chemicals of potential concern ("COPC") are a subset of all chemicals positively identified at the Site. The risks associated with the COPCs are expected to be more significant than the risks associated with other less toxic, less prevalent, or less concentrated chemicals at a site that are not evaluated quantitatively. The process of determining COPCs for the Kim-Stan Landfill Site included a detailed evaluation of the analytical data, a careful analysis of the sources of contamination and areas impacted by such sources, and a review of Site characteristics.

The COPCs are the chemicals found to exceed the screening criteria set forth below and have been detected in at least one sampling location from the following media: channel sediments, flood plain sediments, surface soils, subsurface soils, surface water, leachate, and groundwater. Sampling locations from these environmental media are presented in Figures 7 through 12.

The following screening criteria were used to select or eliminate each chemical:

1. For subsurface soils, surface soils, sediments, surface water, leachate, and groundwater data, concentrations of detected chemicals were compared to the EPA Region III risk- based screening criteria for residential soil. If the maximum detected concentration in surface soils, subsurface soils, or sediments resulted in a carcinogenic risk level of less than 1 x 10~ 6 or hazard quotient of less than 0.1, the chemical was eliminated from the COPC list.

2. If the maximum detected concentration found in surface water, leachate, or groundwater was less than the screening level, the chemical was eliminated as a COPC for human exposure.

3. Inorganic chemicals were eliminated from further consideration if the chemical was considered to be an essential nutrient and had relatively low toxicity (e.g., calcium, magnesium, potassium, and sodium).

4. Inorganic chemicals were eliminated if detected at levels that were statistically identical to background concentrations. This approach was used for surface and subsurface soil only. The background study can be found in the RI in Appendix B of the BLRA report. It should be noted that no background evaluation was conducted for sediment or groundwater.

The constituents retained as COPCs for channel and flood plain sediments, surface soils, subsurface soils, surface water, leachate, and groundwater are listed below.

- Channel Sediments: Arsenic, iron, manganese, and benzo(a) pyrene.
- Floodplain Sediments: Arsenic and iron.
- Surface Soils: None - eliminated in background study.
- Subsurface Soils: None - eliminated in background study.
- Surface Water: Barium, iron, and manganese.
- Leachate: Aluminum, arsenic, barium, iron, lead, manganese, and thallium.
- Groundwater: Arsenic, barium, iron, manganese, nickel, thallium, and vinyl chloride.

Ten COPCs were retained for quantitative risk estimation. At the conclusion of the risk assessment, five chemicals were identified as risk drivers and designated as Chemicals of Concern ("COC"). As Site conditions change (e.g., degradation of landfill contents), it is possible that additional COCs could be identified in the future. The COCs are listed on Table 13.

Based on the findings of the BLRA, the COCs which pose an unacceptable risk to human health and the environment at the Kim Stan Landfill Site include:

- a volatile organic compound (vinyl chloride) and,
- inorganic elements and metals (arsenic, iron, manganese, thallium).

B. Exposure Assessment

As indicated above, EPA did not assess the risks to human health presented through exposure to air, soil on the landfill, surface water or sediments on the landfill, or groundwater on the landfill property. The exposure pathways evaluated in the risk assessment are presented on Table 14 and consist of current and future exposure scenarios for channel and floodplain sediments, surface water, leachate, and groundwater.

(1) Sediment

Sediments at the Site became contaminated via runoff from the landfill. The sediment evaluation was divided into two different sub-matrixes: (1) stream channel sediment, and (2) floodplain sediment. Historical sediment data collected during the July 1997 Site Investigation sampling activities were strictly stream channel sediment data and served as the stream channel data set used in the BLRA. The sediment samples from the Jackson River, the Kim Stan Gully, and several unnamed tributaries to Karnes Creek were off-Site samples and were not used in the human risk assessment. Floodplain sediment samples were collected during the RI since no historical floodplain sediment samples were collected at the Site.

A total of 37 channel sediment and 6 floodplain/seep sediment samples were used in the risk assessment. Exposure to COCs associated with the incidental ingestion (i.e., placing sediment-covered hands in mouth) and dermal absorption (contact of skin with sediment could result in absorption of chemicals through skin) for both sub-matrixes of sediment was evaluated for current and future resident, worker, and trespasser receptor populations.

(2) Surface Water

No surface water samples were collected during the RI. Consequently, historical surface water data from the 1998 Final Site Inspection ("SI") report were used to assess human risk.

Ten (10) samples identified in the 1998 SI report were used in the evaluation. Exposure to COCs associated with incidental ingestion (i.e., swallowing water) was evaluated for current/future trespassers, current/future workers, and current/future residents. It was assumed that trespassers are exposed to surface water each time they visit the Site, or 52 days per year. It was assumed that residents would be exposed 45 days a year and workers exposed 50 days a year.

The amount of water that is ingested is likely to vary considerably, depending on the behavioral patterns of the individual. Some individuals may not ingest any water, while others may drink directly from the surface water. In the absence of information or guidance concerning the ingestion of water from shallow pools, it was assumed that the quantity of water ingested by a trespasser, or adult or child resident, and an adult worker recreating in this area is equal to 0.01 L/hr, one-fifth of the recommended ingestion rate for swimming. The exposure time for residents and workers was assumed to be one hour per day, the national average for swimming, while the trespasser would spend 0.05 hours a day recreating in the area.

Dermal absorption of surface water was evaluated for trespassers, workers, and residents. Dermal absorption of chemicals while recreating in the off-Site assessment area was evaluated for trespassers, workers, and residents. Dermal absorption of chemicals in water may occur when substances are absorbed across the skin. The exposed skin areas used to evaluate dermal contact with surface water are outlined below:

- Adult Resident was based on an average adult male's hands, forearms, feet, and lower legs (6,170 cm 2).

- Child Resident was based on the 50th percentile surface area of the hands, arms, feet, and legs of males age 3-6 (3,900 cm2).

- Trespasser was based on the hands, feet, and legs (5,850 cm2) of males aged 7-16.

It was assumed that current/future residents are exposed to COCs in surface water 45 days per year, workers are exposed 50 days per year, and trespassers for 52 days per year while visiting the Site. The exposure time was assumed to equal 1 hour per day for residents and workers, and 0.5 hour per day for trespassers.

(3) Leachate

No surface water leachate (surface water contaminated by leachate seeps) sampling was conducted for the RI. Data from ten (10) samples identified in the 1998 Final Site Inspection Report were used in the evaluation. Exposure to COCs associated with incidental ingestion (i.e., swallowing leachate) was evaluated for current/future trespassers, current/ future workers, and current/future residents. It was assumed that trespassers are exposed to surface water leachate each time they visit the Site, or 52 days per year. It was assumed that residents would be exposed 45 days per year, while workers would be exposed 50 days per year.

The amount of surface water leachate that is ingested is likely to vary considerably, depending on the behavioral patterns of the individual. Some individuals may not ingest any surface water leachate. In the absence of information or guidance concerning the ingestion of water from shallow pools, it was assumed that the quantity of water ingested by a trespasser, adult resident, child resident, and an adult worker recreating in this area is equal to 0.01 L/hr, one-fifth of the recommended ingestion rate for swimming. The exposure time for residents and workers was assumed to be one hour per day, the national average for swimming, while the trespasser would spend .05 hours a day recreating in the area.

Dermal absorption of surface water leachate was evaluated for trespassers, workers, and residents. Dermal absorption of chemicals while recreating in the assessment area outside the landfill property was evaluated for trespassers, workers, and residents. Dermal absorption of chemicals in water may occur when substances are absorbed across the skin. The exposed skin areas used to evaluate dermal contact with surface water are outlined below:

- Adult Resident was based on an average adult male's hands, forearms, feet, and lower legs (6,170 cm2).

- Child Resident was based on the 50th percentile surface area of the hands, arms, feet, and legs of males age 3-6 (3,900 cm2).

- Trespasser was based on the hands, feet, and legs (5,850 cm2) of males aged 7-16.

It was assumed that current/future residents are exposed to COCs in surface water leachate 45 days per year, workers are exposed 50 days per year, and trespassers are exposed 52 days per year while visiting the Site. The exposure time was assumed to equal 1 hour per day for residents and workers, and 0.5 hour per day for trespassers.

(4) Groundwater

A total of 96 groundwater samples were collected during the August and November 2000 and February and May 2001 field sampling events. Exposure to COCs associated with contaminated groundwater was evaluated for current and future residents, workers, and trespassers. The drinking water ingestion rates that were used for the residents (children and adults) assume that all daily water intake occurs at home. The drinking water ingestion rate for the adult resident is 2 liters per day (L/day). It was assumed that the drinking water intake for children is 1 L/day. The drinking water ingestion intake used for workers assumed that one-half of the daily water intake, or 1 L/day, occurs at the workplace.

Dermal contact with groundwater while showering is considered to be a potential exposure route for future residents. Dermal absorption of chemicals in water may occur when substances are absorbed across the skin. The exposed skin areas used to evaluate dermal contact with groundwater are outlined below:

- Adult Resident was based on an average total body surface area (20,000 cm2).
- Child Resident was based on the 50th percentile total body area for children age 2-6 (ranges from 6,030 cm2 to 7,930 cm2).

The risk assessment assumed that a resident takes a shower for 15 minutes a day.

Inhalation of VOCs emitted from groundwater while showering is considered to be a potential exposure route for future residents. VOCs may be released to indoor air through a variety of home activities, including showering, cooking, dish washing, and laundering clothes. Inhalation while showering was evaluated to account for doses of VOCs received from non-ingestion uses of water for future adult and child residents. The shower air concentration for vinyl chloride, the only volatile COC in groundwater, is 2.5E-02 mg/m3. Tables 15.1 through 15.4 contain the exposure parameters for a child resident, adult resident, and industrial worker exposed to ground water.

C. Toxicity Assessment

The toxicity assessment provides a description of the relationship between a dose of a chemical and the anticipated likelihood of an adverse health effect. The toxicity values describe the quantitative relationship between the level of exposure (dose) to a chemical and the increased likelihood of adverse impacts (response). The intake factors calculated in the exposure assessment were combined with toxicity values and chemical concentrations to estimate a cancer risk or a non-cancer risk.

Key dose-response criteria are EPA cancer slope factors ("CSFs") for assessing cancer risks and EPA-verified reference dose ("RfD") values for evaluating non- cancer effects. Toxicity values are derived from either epidemiological or animal studies, to which uncertainty factors are applied. These uncertainty factors account for variability among individuals, as well as for the use of animal data to predict effects on humans. These toxicity values are derived from the EPA Integrated Risk Information System ("IRIS") database and EPA's Health Effects Assessment Summary Tables ("HEAST").

The CSF is multiplied by the estimated daily intake rate of a potential carcinogen to provide an upper-bound estimate of the probability of a response per unit intake of a chemical over a lifetime. CSFs are expressed in units of mg/kg-day-1 . The upper bound estimate reflects the conservative estimate of risks calculated from the CSF. This approach makes underestimation of the cancer risk unlikely. This chemical-induced risk calculated based on the CSF is in addition to the risk of developing cancer due to other causes over a lifetime. Consequently, the risk estimates in this risk assessment are referred to as incremental or excess lifetime cancer risks.

The chronic Reference Dose ("RfD"), expressed in units of mg/kg-day, is an estimated daily chemical intake rate for the human population, including sensitive subgroups, that appears to be without appreciable risk of non-carcinogenic effects if ingested over a lifetime. Estimated intakes of COCs are compared with their RfDs to assess the non-carcinogenic hazards.

Non-cancer toxicity data for oral and dermal exposure to the COCs is found in Table 16.1. Table 16.2 contains non-cancer toxicity data for inhalation exposure to COCs.

Cancer toxicity data for oral and dermal exposure to COCs is found in Table 17.1. Table 17.2 contains cancer toxicity data for inhalation exposure to COCs.

D. Risk Characterization

The risk characterization is an evaluation of the nature and degree of potential carcinogenic and noncarcinogenic health risks posed to current and hypothetical future receptors at a site. Human health risks for noncarcinogenic and carcinogenic effects are discussed independently because of the different toxicological endpoints, relevant exposure durations, and methods employed in characterizing risk. The potential for carcinogenic effects is limited to only those chemicals classified as carcinogens, while both carcinogenic and noncarcinogenic chemicals are evaluated for potential noncarcinogenic effects.

Noncarcinogenic and carcinogenic risks were evaluated for each exposure pathway and scenario by integrating the calculated exposure doses with the toxicity criteria for the COCs. The evaluation of carcinogenic risks are presented in Tables 18.1 and 18.2, and the evaluation of noncarcinogenic risks are presented in Tables 18.4 and 18.6.

Carcinogenic Risks

The potential health risks associated with carcinogens were estimated by calculating the increased probability of an individual developing cancer during their lifetime as a result of exposure to a particular contaminant at the Site. The chemical-specific exposure estimates (i.e., average lifetime dose) were multiplied by the chemical-and route-specific slope factor, averaged over the expected duration of exposure, to arrive at a unitless measure of probability, expressed numerically (e.g., 1 x 10-4 or 1E-4) of an individual developing cancer as a result of chemical exposure at the Site.

A cancer risk estimate is a probability that is expressed as a fraction less than one. For example, a cancer risk of 1 x 10-4 (1E-4) refers to an upper bound increased chance of one in ten thousand of developing cancer as a result of site-related exposure to a carcinogen over the expected exposure duration. The NCP recommends a target range for excess cancer risk of 1E-4 to IE-6 (one in ten thousand to one in a million).

Non-Carcinogenic Hazards

The potential for non-carcinogenic effects due to exposure to a particular chemical is expressed as the hazard quotient ("HQ"). An HQ was calculated by dividing the estimated intake or dose of a chemical by the chemical- specific toxicity value or non-cancer RfD. Implicit in the HQ is the assumption of a threshold level of exposure below which no adverse effects will occur. If the HQ exceeds one, Site-specific exposure exceeds the RfD and the potential for non-cancer adverse effects may exist.

The Hazard Index ("HI") is generated by adding the HQs for all chemical(s) of concern that affect the same target organ (e.g., liver) within or across those media to which the same individual may reasonably be exposed. A HI less than or equal to one indicates that toxic noncarcinogenic effects are unlikely.

Risk Characterization Uncertainties

Ideally, areas of exposure should be defined based on actual exposures or known behaviors of receptors at a site. Often, however, as in the case of this risk assessment, this information is unavailable. Lacking absolute knowledge about the activities that occur at the Kim Stan Site or about the behavior of receptors at or near the Site, it was necessary to make some assumptions. This risk assessment made assumptions about exposure units (or areas) based on contaminant distribution and likely areas of exposure based on Site features (i.e., presence of the marshy area). Such assumptions will add to the uncertainty in the baseline risk assessment.

Each complete exposure pathway concerns more than one contaminant. Uncertainties associated with summing risks or hazard quotients for multiple substances are of concern in the risk characterization step. The assumption ignores the possibility of synergistic or antagonistic activities in the metabolism of the contaminants. This could result in over-or under-estimation of risk.

The potential risks developed for the Kim-Stan Landfill were directly related to COPCs detected in the environmental media at this Site. No attempt was made to differentiate between the risk contribution of other locations (including background) and that of the Kim-Stan Landfill.

The RfDs for iron, which was identified as a chemical of concern at the Site, is a provisional (interim) value, meaning that it has not received the verification necessary to be placed by EPA on IRIS or HEAST. Additional toxicological data would be needed in order to complete this verification. For example, the oral RfD for iron was based on the Recommended Daily Allowance for this metal. In addition, the high iron concentrations may be natural to the sediments in the area.

The data evaluation uncertainty included the "B" qualified data from the groundwater data set. This bases the risk assessment on essentially one round of data which may result in an overestimation of risk.

A background study was conducted for surface soil and subsurface soil only. No background samples were collected for sediments, floodplain sediments, or groundwater given the scope of the RI field effort. Consequently, the risks associated with the surface soil and subsurface soil pathways were calculated without a background contribution. However, the risks from sediment, flood plain sediment, and groundwater related pathways were calculated with a background contribution.

The adult worker pathway may overestimate the exposure potential. It is likely that the adult worker has less than the estimated exposure since it is unlikely for the workers to frequent the evaluated area. This may result in an overestimation of the risk and hazards to the on-Site industrial/commercial worker.

A central tendency evaluation can provide the risk assessor a different perspective on the data. Central tendency evaluations present average or median (50th percentile) assumptions while reasonable maximum exposure evaluations present upperend (90th - 95th percentile) assumptions. Changing exposure assumptions from upperend to average values can result in cancer risks falling below IE-04.

E. Results

The major conclusions of the human health risk assessments for the Kim Stan Landfill Site are provided below.

(1) Surface water

No receptors are expected to experience adverse health effects from exposure to surface water. The calculated cancer and non- cancer risks are below EPA's target risk range.

(2) Leachate seeps

No receptors are expected to experience adverse health effects from exposure to the leachate seeps. The calculated cancer and non- cancer risks are below EPA's target risk range.

(3) Sediment

The hazard index for a child resident exposed to channel and floodplain sediment is greater than 1.0, which is mostly due to iron. The calculated intake for ingestion of iron for a hypothetical child resident is less than the Recommended Daily Allowance ("RDA") for a child. Therefore, exposure of a hypothetical child resident to Site-related iron is not expected to cause adverse health effects.

(4) Groundwater

The non-carcinogenic health risk associated with groundwater for child and adult residents and industrial workers is greater than the target HI of 1.0 (36, 15, and 5, respectively). Therefore, adverse heath affects are anticipated from drinking groundwater. The chemicals that are primarily responsible for this risk are iron, manganese, and thallium.

The incremental cancer risk to child and adult residents and industrial workers drinking groundwater is greater than EPA's target risk of IE-4 (6.4E-4, 1.1E-3, and 4E-4, respectively, a 6-10 chance in 10,000 of getting cancer if one were to drink 1 to 2 liters of groundwater everyday over a lifetime). The chemicals that are primarily responsible for the carcinogenic risk are arsenic and vinyl chloride.

Different combinations of the above-described routes of exposure were considered for various groups of individuals that could be exposed to Site contaminants. Table 20 summarizes the respective risk levels presented to each group of individuals by the various contaminated media. Table 11 summarizes the contaminants exceeding Maximum Contamination Levels ("MCLs") established under the Safe Drinking Water Act and the associated well locations. There are unacceptable risks presented at the Site due to the presence of arsenic, vinyl chloride, and thallium in groundwater. **1**

(5) Conclusions

An unacceptable risk to human health exists if Site contamination is not addressed. Actual or threatened releases of hazardous substances from this Site, if not addressed, may present a current or potential threat to human health or welfare.

B. Ecological Risk Assessment

An ecological risk assessment ("ERA") was prepared to evaluate ecological risks to off-Site areas presented by Site contaminants. This ERA was based on data generated during investigations performed between 1981 and 2001. The methodology used in this ERA was based on, and in compliance with, guidance available from EPA Region 3 for conducting ERAs and also followed EPA's Ecological Risk Assessment Guidance for Superfund: Process for Designing and Conducting Ecological Risk Assessments (EPA 1997). The ERA presumes the effectiveness of the presumptive remedy and therefore is focused on impacts to sediment and floodplain soils since contaminated groundwater flow discharge and surface runoff will be eliminated through remedial measures.

A streamlined ecological risk assessment was conducted for the Site which included an analysis of the environmental setting, ecological habitats, potential receptors, contaminants, and potentially complete exposure pathways.

The ERA concluded that there are no significant ecological risks to the aquatic habitats downgradient of the Site. While several PAHs, pesticides, and inorganic compounds exceeded initial ecological screening values, subsequent studies of sediment toxicity, designed to assess this habitat, did not indicate that the sediments were toxic to Hyalella azteca, a representative benthic invertebrate. While there are some uncertainties related to the interpretation of the sediment toxicity data, there is some positive corroboration in that the benthic community bioassessment indicated a fairly diverse benthic community in these same aquatic habitats. Considering both lines of data, it can be concluded that there are no significant risks to the aquatic habitats and the associated ecological communities.

1 Iron and manganese, which are not hazardous substances, contribute additional risk to human health.

VIII. REMEDIAL ACTION OBJECTIVES

EPA's extensive experience in site remediation has revealed certain consistencies in site characteristics and remedies. Some categories of sites have similar characteristics, such as types of contaminants present, past industrial use, or environmental media affected. At similar sites, standard remedies (called "Presumptive Remedies") can be applied. The Presumptive Remedy approach looks for remedies that are appropriate for specific site types and/ or contaminants. The objective of the Presumptive Remedy approach is to use EPA's past experience to streamline site investigations and make remedy selection faster and more focused. Some examples of the types of sites for which there is Presumptive Remedy guidance include: VOCs in soils, municipal landfills, wood treating facilities and contaminated groundwater sites.

EPA guidance, which is identified in the Administrative Record file for the Site, states that Presumptive Remedies are expected to be used at all appropriate sites, except under unusual site-specific circumstances. This means that candidate sites should be investigated to determine the applicability of the Presumptive Remedy approach. A remedy of containment is appropriate for landfills where the volume and heterogeneity of the disposed waste generally makes removal and/or treatment impractical. The presumptive remedy may be applied unless the integrity of the containment system would be threatened if certain waste is left in place.

Factors considered in determining the applicability of the Presumptive Remedy approach at this Site include the fact that the Site is a solid waste landfill, contaminant levels are at levels expected for solid waste landfills, and the primary problems associated with the Site are due to the lack of proper closure. As a result, the RI and FS were streamlined so that activities were focused on collection of data necessary for implementation of a remedy typically used at a solid waste landfill.

The following remedial objectives have been developed to address risks associated with the Site:

- prevent direct contact with and migration of the landfill waste,
- mitigate production and uncontrolled release of landfill gases;
- mitigate production and uncontrolled release of leachate; and
- restore groundwater quality through source control.

IX. DESCRIPTION OF ALTERNATIVES

The following locations and media at the Site warrant action to minimize potential exposure to hazardous substances as described above:

1. the landfill waste mass
2. groundwater
3. leachate

This section of the ROD identifies the remedial alternatives considered by EPA for implementation at the Site to reduce unacceptable risks presented in these locations/media.

Alternative #1 : No Action

Capital Cost:	$ 0.00
Annual O&M Cost:	$ 0.00
Total Present Worth Cost:	$ 0.00
Time to Implement:	0 months

Alternative #1 is the "No Action" alternative. Under the No- Action alternative, no additional remedial measures would be implemented at the Site to address the landfill, leachate, or contaminated groundwater. Under this remedial alternative, none of the remedial action objectives established for Site would be attained and threats posed by the Site would not be mitigated.

Alternative #2: Multi-layer Cap, Groundwater Monitoring, Leachate Containment and Institutional Controls.

Alternative #2 includes the following common components:

1. Covering the landfill with a multi-layer cap

2. Leachate management through one of several options described in detail below

3. Groundwater monitoring

4. Institutional controls to protect the integrity of the landfill cover and prevent the use of ground water.

Alternative #2 contains the landfill contents using a multi-layer cap containment system. The various components of a generic multi-layered cap are described below (from ground surface to top of waste) and are depicted on Figure 13. The components of the multi-layer cap system will be finalized during remedial design.

Vegetative Cover: A low-maintenance vegetative cover native to the region would be provided to stabilize the landfill cap system and reduce the potential for erosion. Design of the cap would, to the extent practicable, incorporate a vegetative scheme which is aesthetically pleasing and provides protection of the landfill cap.

Erosion Layer: The erosion layer is no less than 6 inches in thickness and would consist of an organic soil capable of sustaining vegetative cover. This material would be imported from off-Site sources.

Cover Soil Layer: The cover soil layer is no less than 18 inches in thickness and serves to protect the underlying geosynthetics from degradation due to frost and human and animal contact. The cover soil layer material would be imported from off-Site sources.

Geocomposite Drainage Layer: A plastic drainage layer would be placed over the plastic water barrier (geomembrane hydraulic barrier) to drain the infiltrated surface stormwater.

Low density polyethylene ("LDPE") Geomembrane: The hydraulic barrier component of the cap system consists of a 40-mil LDPE, or low density plastic geomembrane layer. The geomembrane provides a hydraulic barrier or water barrier to minimize infiltration of precipitation into the landfill waste mass, thus reducing leachate production of the landfill and leaching of potential contamination into the ground water.

Geocomposite Gas Venting Layer: The geocomposite gas venting layer is comprised of essentially the same material as the geocomposite drainage layer. This layer serves to passively collect and convey any gas that may accumulate under the overlying hydraulic barrier layer.

Bedding Layer: The first layer placed over the landfill area consists of a minimum 12-inch thick compacted soil layer. The soil in this layer serves to provide a workable graded surface on which to construct the remaining layers of the cover system. The bedding layer also acts to separate the overlying cap system from potentially damaging solid waste materials.

All landfill waste located within the Route 696 right of way and outside the landfill property would be consolidated within and below the landfill cap. All waste consolidated into the landfill will be placed a minimum of 50 feet from the property boundary. Regrading of the landfill would be accomplished to provide adequate stormwater management controls, such as perimeter drainage swales and detention ponds. The existing landfill leachate underground storage tanks would be removed as part of this alternative. Existing storm water/leachate control pipe lines and manholes used during operation of the landfill that are not incorporated into the remedy would either be removed or abandoned in-place (e.g., filled with concrete). The landfill cap would cover the entire waste mass following consolidation activities. Design of the multi-layer cap system would, to the extent practicable, consider the use of vegetation to reduce leachate volumes through evaporation of water from soils and plant leaves.

Containment of the landfill by using a multi-layer (i.e., soil and geosynthetic layers) cover system with an infiltration rate of IE-7 cm/sec would minimize the amount of leachate generation to the maximum extent possible, would minimize the quantity of leachate to be treated, and would prevent exposure to landfill contaminants. EPA expects that installation of the multi-layer cover atop the landfill would inhibit production of new leachate and would, together with the leachate collection and treatment component, facilitate the cleanup of ground water to levels that are protective of human health and the environment.

The ground water monitoring component of Alternative #2 includes establishment of appropriate background wells and quarterly sampling of groundwater immediately down gradient of the landfill (between the landfill and the Jackson River). The monitoring component would include sampling for metals, pesticides, PCBs, semi-volatile organic compounds and volatile organic compounds. Assessment of the effectiveness of the source controls and determination of whether or not groundwater quality is improving would be accomplished through annual review of groundwater monitoring data and the Five Year Review process.

The ground water cleanup Performance Standards would be the more stringent of

(1) non-zero Federal Maximum Contaminant Level Goals ("MCLGs");
(2) Federal Maximum Contaminant Levels ("MCLs");
(3) State MCLs; and
(4) existing groundwater standards promulgated by Virginia

adjusted downward (more stringent) as necessary to ensure that the cumulative effect of contamination in ground water would not result in a cancer risk greater than 1 in 100,000 or a Hazard Index greater than 1.0, for thallium, arsenic, and vinyl chloride (these are hazardous substances identified as Contaminants of Concern and found to exceed Federal MCLs at the Site **2**), provided that the performance standard for any such contaminant shall not be below the background concentration. EPA expects that using source controls as provided under this alternative will achieve attainment of the performance standards within a 15 year period. EPA expects that the groundwater would be suitable for unlimited use once the performance standards have been met.

Institutional controls would be implemented (1) at the landfill property to prohibit excavation and other activities that would adversely impact or disturb the multi-layer cap, and (2) at the landfill property, within a 200 foot buffer around all sides of the landfill property, and between the northern edge of this buffer- enlarged area and the Jackson River to prevent use of groundwater for drinking, bathing, or cooking until the groundwater performance standards are attained (see Figure 14).

2 The Proposed Plan inadvertently identified antimony and nickel as hazardous substances found to exceed Federal MCLs at the Site. A review of data confirms that antimony, which is not a Contaminant of Concern, was not found in groundwater at levels exceeding the Federal MCL. There is no Federal MCL for nickel, which is a hazardous substance.

As indicated previously, Alternative #2 would include a leachate management component. The following alternatives were considered for management of the landfill leachate:

Alternative #2a: Monitoring and Institutional Controls
Alternative #2b: Leachate Control by Phytoremediation
Alternative #2c: Leachate Control by Collector Trench/Barrier Wall Installation, Pump and Treat, Discharge to POTW
Alternative #2d: Leachate Control by Collector Trench/Barrier Wall Installation, Pump and Treat, Discharge to Surface Water

The various components considered for mitigating risks presented by the leachate in conjunction with a multi-layer cap are presented below. Costs for Alternatives #2a through #2d include the cost of the leachate component, multi-layer cap, groundwater monitoring, and institutional controls.

<u>Alternative #2a</u>: Long-Term Monitoring With Institutional Controls

Capital Cost:	$5,329,000
Annual O&M Cost:	
Years 1 through 5:	$ 198,000
Years 6 through 30:	$ 181,250
Total Present Worth Cost:	$7,649,000
Time to Implement:	1 year

This Alternative combines the multi-layer cap and groundwater monitoring discussed above with long-term monitoring and institutional controls to mitigate the risks presented by the landfill leachate. Leachate management would consist of monitoring leachate seeps and contaminant migration in the shallow aquifer, and implementation of institutional controls to prevent contact with leachate/ground water (although there are no known public or private wells in the vicinity of the leachate seeps or contaminant plume, possible future use of ground water would require such restriction). Monitoring of the shallow aquifer would be required to evaluate long-term changes in water quality in the future. Finally, the leachate seep areas along the north side of Route 696 would be fenced to eliminate the potential for direct exposure to leachate.

<u>Alternative #2b</u>: Leachate Management by Phytoremediation

Capital Cost:	$5,727,000
Annual O&M Cost:	
Years 1 through 5 :	$ 221,000
Years 6 through 30:	$ 204,250
Total Present Worth Cost:	$8,339,000
Time to Implement: 5 years	

Alternative #2b contemplates the use of Hybrid Poplar ("HP") or some other variety of tree to control the discharge of leachate/ground water from the landfill mass. Based on the Hydrologic Evaluation of Landfill Performance ("HELP") model analysis and ground water flow rates, approximately 9,000 gpd (500 gpd infiltration and 8,500 gpd of ground water inflow) of leachate would be produced after construction of a multi-layer cap. Single HP trees have reported water absorption and transpiration rates of about 20 to 25 gpd. Therefore, in this alternative, approximately 350 HP trees would be required to uptake the leachate being generated under a multi-layer cap containment alternative. It should be noted that trees are only effective during the growing season (April-October), and would be relatively ineffective during winter months. Trees would also require approximately five years to become established enough to provide the maximum rates of water evaporation from the soils and tree leaves.

To control leachate and ground water discharge, trees would be planted in an approximate 100 foot wide buffer zone along the south side of Route 696. This is the area where the leachate currently pools behind the existing leachate containment system. To promote growth down to the saturated zone more quickly, the area around the trunk of each tree would be sealed to prevent surface infiltration and encourage deep root growth.

The trees would be maintained, pruned, and replaced on an as needed basis. Testing of plant waste (such as dead leaves, twigs, or branches) would be required to establish whether or not the plant waste requires management and disposal pursuant to the Resource Conservation and Recovery Act ("RCRA"). This alternative also requires long-term monitoring of the leachate/ground water quality in the tree stand area to evaluate the effectiveness of leachate/ground water remediation. Monitoring can be accomplished through existing monitoring points.

<u>Alternative #2c</u>: Leachate Control by New Collector Trench/Barrier Wall Installation, Pump and Treat, Discharge to POTW

Capital Cost:	$7,345,000
Annual O&M Cost:	
Years 1 through 5:	$ 212,783
Years 6 through 30:	$ 196,033
Total Present Worth Cost:	$9,847,000
Time to Implement:	6 months

The integrity of the existing leachate collection system is relatively unknown, as the construction of this system was not well documented. In addition, the existing system does not effectively control leachate and groundwater migration as evidenced by current Site conditions.

Currently the Kim Stan Landfill leachate is intercepted by a barrier wall located on the south side of Route 696 and pools within the northern end of the landfill. Information on past operations of the landfill indicates that a large amount of leachate was released from the landfill leachate pool to the surface via a two-inch pipe under Route 696. Flow rates observed during the RI activities support this information. Other leachate seeps found on the northern side of Route 696 provide additional evidence that the current barrier system is not functioning properly.

In this alternative, a trench would be constructed along the north side of the landfill bordered by Route 696, and around the east and west sides of the landfill so as to minimize the potential for leachate to migrate around the cutoff wall. The bottom of the trench would key into the clay stratum on which the leachate is perched. Figure 15 depicts the conceptual location of the collector/barrier trench. The actual location, size and materials used would be determined during remedial design.

The collector system includes placement of permeable gravel within an excavated trench containing a perforated plastic pipe. The top of the stone would correspond to historically high leachate levels. The stone would be wrapped in non-woven geotextile to minimize fine soil particles from clogging the stone and collection pipe. The remaining depth of the trench would be backfilled. Excess excavated soils would be placed below the landfill cap. Any waste encountered during installation of the collector trench and barrier wall would be consolidated into the landfill. A 60-mil high density polyethylene liner would be placed on the northern side of the trench between the landfill and Route 696 to act as a low-permeable barrier to prevent the flow of leachate through the trench.

The leachate collector/barrier trench would prevent migration of leachate by providing a means to collect the leachate within the landfill. The collected leachate would be piped to the Low Moor Waste Water Treatment Plant ("LMWWTP") in Low Moor, Virginia (approximately 1-2 miles from the Site), for treatment. As part of this option, all piping would be installed to convey the leachate to the treatment plant (see Figure 16). EPA estimates that this would include the installation of 7,600 feet of 2-inch force main, 2 pump stations, 2,400 feet of 12-inch gravity sanitary sewer line, 1 ,000 feet of 1 5- inch gravity sanitary sewer line, and 1 6 manholes. The treatment plant would be upgraded to ensure that it could treat the leachate. EPA estimates that upgrading of the LMWWTP would require 1 new sequencing batch reactor and the associated piping and equipment. A conceptual diagram of the upgrade components that would be added to the LMWWTP is shown in Figure 17. The actual lengths and sizes of pipe and components needed for the collection and conveyance of the leachate to the LMWWTP and the upgrades to the plant would be determined during remedial design.

Alternative #2d: Leachate Control by Collector Trench/ Barrier Wall Installation, Pump and Treat, Discharge to Surface Water

Capital Cost:	$ 6,791,000
Annual O&M Cost:	
Years 1 through 5:	$ 322,000
Years 6 through 30:	$ 305,250
Total Present Worth Cost:	$10,828,000
Time to Implement:	1 year

This alternative incorporates the leachate collector trench and barrier wall described in Alternative #2c, but the collected leachate would be treated at an on-Site treatment plant and discharged to surface water.

This alternative would require a treatment plant that operates at 15 gpm for approximately 10 to 12 hours/day. Since the leachate predominantly contains metals including iron and manganese, the leachate would be treated to remove metals as well as other contaminants. The components of the treatment system may include an equalization tank, metals removal system consisting of a clarifier and pressure filter, and a sludge thickening and dewatering system. A conceptual process flow diagram is shown in Figure 18. The actual system configuration would be finalized during remedial design.

Alternative #3: Soil Cap, Ground Water Monitoring, Leachate Containment and Institutional Controls.

Alternative #3 is identical to Alternative #2 except that containment of the landfill waste is accomplished using a soil cover rather than a multi-layer cap. Alternative #3 includes the following components:

- Covering the landfill with a soil cap
- Leachate management through one of several options
- Groundwater monitoring
- Institutional controls to protect the integrity of the remedial action and prevent use of groundwater.

Alternative #3 contains the landfill contents with a soil cap containment system. The various components of a generic soil cap are described below (from ground surface to top of waste) and are depicted on Figure 19:

Vegetative Cover: A low-maintenance vegetative cover native to the region would be provided to stabilize the landfill cap system and reduce the potential for erosion. Consideration would be given in the design, to the extent practicable, for use of vegetation that would not only be protective of the cap, but would be aesthetically pleasing and promote evaporation of water through the soil and plant material.

Erosion Layer: The erosion layer is 6 inches in thickness and consists of an organic loam top soil or organically amended soil capable of sustaining a viable low-maintenance vegetative cover. This material would be imported from off- Site sources.

Infiltration Layer: The infiltration layer consists of an 18-inch thick compacted soil barrier having a permeability of less than 1 x 10-5 cm/sec. The material for this layer would be imported from off-Site sources.

Bedding Layer: The first layer placed over the landfill area consists of a minimum 12-inch thick compacted cap bedding layer. The soil in this layer serves to provide a workable graded surface on which to construct the remaining layers of the cover system. The bedding layer also acts to separate the overlying cap system from potentially damaging solid waste materials. The bedding layer would incorporate the existing cover soil of the landfill, supplemented with borrow material to obtain a total minimum thickness of 12 inches.

All landfill waste located at the surface of the Route 696 right of way and outside the landfill property would be consolidated within and below the landfill cap. All waste consolidated into the landfill would be placed a minimum of 50 feet from the property boundary. Regrading of the Site prior to placement of the soil cap would ensure adequate drainage and gas venting. The maximum slope would be 33% (3H:1V). Slopes would be constructed in those areas where existing grades are not adequate. Stormwater management controls, such as perimeter drainage swales and detention ponds would be included. The existing underground leachate storage tanks would be removed. Existing storm water/ leachate control pipe lines and manholes that are not incorporated into the remedy would either be removed or abandoned in-place (e.g., filled with cement). The landfill cap would cover the entire waste mass following consolidation activities. Design of the soil cap system would, to the extent practicable, consider the use of vegetation to reduce leachate volumes through evaporation of water from soils and plant leaves.

The ground water cleanup standards, monitoring and institutional control components of Alternative #3 are the same as those for Alternative #2. Alternative #3 also includes a leachate containment and treatment component. The following leachate management options are the same as those described above for Alternative #2. However, due to the increased volume of leachate associated with Alternative #3, there are differences in costs associated with the leachate containment options presented below as compared to the leachate management options presented in Alternative #2. The following alternatives were considered for containment and treatment of the landfill leachate:

Alternative #3a: Monitoring and Institutional Controls
Alternative #3b: Leachate Control by Phytoremediation
Alternative #3c: Leachate Control by Collector Trench/Barrier Wall Installation, Pump and Treat, Discharge to POTW
Alternative #3d: Leachate Control by Collector Trench/Barrier Wall Installation, Pump and Treat, Discharge to Surface Water

The various components considered for mitigating risks presented by the leachate in conjunction with a soil cap are presented below. Costs for Alternatives #3a through #3d include the cost of the leachate component, soil cap, groundwater monitoring, and institutional controls.

Alternative #3a: Long-Term Monitoring With Institutional Controls

Capital Cost:	$ 3,481,000
Annual O&M Cost:	
Years 1 through 5:	$ 198,000
Years 6 through 30:	$ 181,250
Total Present Worth Cost:	$ 5,801,000
Time to Implement:	1 year

This option is identical to Alternative #2a, except that a soil cover would be used instead of a multi-layer cap.

Alternative #3b: Leachate Management by Phytoremediation

Capital Cost:	$ 4,707,000
Annual O&M Cost:	
Years 1 through 5:	$ 221,000
Years 6 through 30:	$ 204,250
Total Present Worth Cost:	$ 7,311,000
Time to Implement:	5 years

This option is identical to Alternative #2b, except that a soil cover would be used instead of a multi-layer cap.

Based on HELP model analysis and groundwater flow rates, approximately 28,000 gpd of leachate (19,500 gpd infiltration and 8,500 gpd of ground water inflow) would be produced after installation of a soil cap. Single Hybrid Poplar trees have reported water absorption and transpiration rates of about 20 to 25 gpd (EPA, 1998). Therefore, in this option, approximately 1,000 trees would be required to uptake the leachate generated under the soil cap containment system. It should be noted that trees are only effective during the growing season (April-October), and would be relatively ineffective during winter months. The trees would also require approximately five years to become established enough to provide the maximum evapotranspiration rates.

Alternative #3c: Leachate Control by New Collector Trench/Barrier Wall Installation, Pump and Treat, Discharge to POTW

Capital Cost:	$ 5,497,000
Annual O&M Cost:	
Years 1 through 5:	$ 244,000
Years 6 through 30:	$ 227,250
Total Present Worth Cost:	$ 8,386,000
Time to Implement:	1 year

This option is identical to Alternative #2c, except that a soil cover would be used instead of a multi-layer cap.

Alternative #3d: Leachate Control by Collector Trench/Barrier Wall Installation, Pump and Treat, Discharge to Surface Water

Capital Cost:	$ 5,527,000
Annual O&M Cost:	
Years 1 through 5:	$ 472,000
Years 6 through 30:	$ 455,250
Total Present Worth Cost:	$ 11,245,000
Time to Implement:	1 year

This option is identical to Alternative #2d, except that a soil cap would be used instead of a multi-layer cap.

This alternative would require a treatment plant that operates at 40 gpm for approximately 12 hours/day. Since the leachate predominantly contains metals including iron and manganese, the leachate would be treated to remove metals as well as other contaminants. The various components of the treatment system may include an equalization tank, metals removal system consisting of a clarifier and pressure filter, and a sludge thickening and dewatering system. The conceptual process flow diagram is shown in Figure 18. The system configuration would be finalized in the remedial design.

X. COMPARATIVE ANALYSIS OF ALTERNATIVES

The remedial alternatives summarized in this ROD have been evaluated against the nine decision criteria set forth in the NCP (see 40 C.F.R. § 300.430(e)(9)). These nine criteria are organized into three categories—threshold criteria, primary balancing criteria, and modifying criteria. Threshold criteria must be satisfied in order for an alternative to be eligible for selection. Primary balancing criteria are used to weight major trade- offs between alternatives. Modifying criteria are formally taken into account after public comment has been received. The criteria, as well as the evaluation of each alternative against such criteria, are set forth below:

Threshold Criteria:

1. ***Overall Protection of Human Health and the Environment*** addresses whether a remedy provides adequate protection of human health and the environment from unacceptable risks posed by hazardous substances or pollutants or contaminants and describes how risks are eliminated, reduced, or controlled through treatment, engineering controls, or institutional controls.

2. ***Compliance with Applicable or Relevant and Appropriate Requirements (ARARs)*** addresses whether a remedy will meet all of the applicable, or relevant and appropriate requirements of Federal and State environmental statutes and regulations and/or whether there are grounds for invoking a waiver.

Primary Balancing Criteria:

3. ***Long-Term Effectiveness*** refers to the ability of a remedy to maintain reliable protection of human health and the environment over time once cleanup goals are achieved.

4. ***Reduction of Toxicity, Mobility, or Volume Through Treatment*** addresses the degree to which treatment will be used to reduce the toxicity, mobility, or volume of the contaminants causing site risks.

5. ***Short-Term Effectiveness*** addresses the period of time needed to achieve protection and any adverse impacts on human health and the environment that may be posed during the construction and implementation period until cleanup goals are achieved.

6. ***Implementability*** addresses the technical and administrative feasibility of a remedy, including the availability of materials and services needed to implement a particular option.

7. ***Cost*** includes estimated capital, operation and maintenance costs, and present worth costs.

Modifying Criteria:

8. ***State Acceptance*** indicates whether the State concurs with, opposes, or has no comment on the remedy.

9. ***Community Acceptance*** considers whether the community agrees with the remedy.

Overall Protection of Human Health and the Environment:

A primary requirement of CERCLA is that the selected remedial alternative be protective of human health and the environment. A remedy is protective if it reduces current and potential risks to acceptable levels, as set forth in the NCP, for each exposure pathway at the Site.

Alternative #1 (No Action), would not effectively reduce risk to human health and the environment. The uncontrolled releases of leachate would continue and the potential for exposure to the landfill waste would remain. Groundwater in the area would continue to be adversely effected. Both current and potential future users of the Site would be exposed to unacceptable human health risks. Because this alternative does not meet the threshold criteria of protection of human health and the environment, it will not be considered further in this analysis.

Alternatives #2a and #3a also would not be protective of human health and the environment because they do not fully address the potential for exposure to and migration of contaminants in the landfill leachate. Since Alternatives #2a and #3a do not meet the threshold criteria of protection of human health and the environment, they will not be considered further in this analysis.

Alternatives #2b and #3b would also not be protective of human health and the environment because of the unknown effectiveness of phytoremediation on leachate containing metals. According to phytoremediation literature, some phytoremediation techniques are still in laboratory scale and are presently being field evaluated. There are some preliminary data for phytoremediation of soils and groundwater containing chlorinated organics, but very little data for phytoremediation of leachate containing metals. In addition, it is difficult to interpret data or infer results between the various plant species that were used in the phytoremediation experiments/ field studies and apply them to trees at the Kim Stan Site. Therefore, it is difficult to determine with any certainty whether phytoremediation is likely to be effective in reducing the risk at the Site without field/ pilot/laboratory scale studies. As a result, Alternatives #2b and #3b do not meet the threshold criteria of protection of human health and the environment and will not be considered further in this analysis.

Alternatives #2c, #2d, #3c, and #3d would all be protective of human health and the environment. Each of these alternatives would reduce exposure to, and migration of, Site contaminants.

Alternatives #2c and #2d would achieve protectiveness using a multi-layer cap and one of several leachate management options. The multi-layer cap would prevent direct exposure to landfill contents and decrease leachate production to the maximum extent possible.

Alternatives #3c and #3d would achieve protectiveness using a soil cover (instead of a multi-layer cap) and one of several leachate management options. The soil cover would prevent direct exposure to landfill contents and decrease leachate production, although less so than with the multi-layer cap.

The leachate management option of Alternatives #2c, #2d, #3c, and #3d would prevent migration of leachate by providing a barrier wall to contain the leachate. In the case of Alternatives #2c and #3c, the collected leachate would be pumped to the Low Moor Waste Water Treatment Plant for treatment. Alternatives #2d and #3d would require treatment of collected leachate at an on-Site treatment plant.

Institutional controls would protect the integrity of the landfill cover and restrict use of groundwater in Alternatives #2c, #2d, #3c, and #3d.

Compliance with ARARs:

Any cleanup alternative selected by EPA must comply with all applicable or relevant and appropriate federal and state environmental requirements. Applicable requirements are those substantive environmental standards, requirements, criteria, or limitations promulgated under federal or state law that are legally applicable to the remedial action to be implemented at the site. Relevant and appropriate requirements, while not being directly applicable, address problems or situations sufficiently similar to those encountered at the site that their use is well-suited to the particular site.

Alternatives #2c, #2d, #3c, and #3d would comply with all ARARs. The ARARs are identified in Table 21 . Key ARARs are discussed below.

Alternatives #2c, #2d, #3c, and #3d would comply with landfill, landfill gas, and stormwater management ARARs. Both the soil cap and the multi-layer cap would meet the state and federal landfill cover and gas management requirements. Engineering controls (e.g., dust suppression, sediment and erosion controls) would be used during construction of Alternative #2c, #2d, #3c, and #3d during earth moving activities. Stormwater and sediment controls for Alternatives #2c, #2d, #3c, and #3d would need to be considered during design to attain stormwater management ARARs.

Alternatives #2c and #3c would meet the State and Federal ARARs associated with the treatment and discharge of leachate by providing treatment at the Low Moor Waste Water Treatment Plant. Alternatives #2d and #3d would also comply with these requirements, but would do so by use of an on-Site leachate treatment plant.

The source control provided by Alternatives #2c, #2d, #3c, and #3d at the Kim Stan Landfill Site is expected to reduce groundwater contaminants to levels that are protective of human health and the environment. These levels would additionally attain all State and Federal ARARs pertaining to groundwater.

Long-Term Effectiveness and Permanence:

Alternatives #2c and #2d would be effective at reducing risks to acceptable levels and would meet remedial action objectives. These alternatives utilize common and proven technologies that are reliable in the long-term. Alternatives #3c and #3d are less effective than Alternative #2c and #2d in meeting the remedial action objectives since they do not achieve the same degree of leachate reduction. Alternatives #3c and #3d also utilize common and proven technologies, but are less reliable than Alternatives #2c and #2d in the long-term.

The use of the multi-layer cap system associated with Alternatives #2c and #2d would be effective in reducing risks by (1) minimizing, if not preventing, stormwater infiltration into the waste material, thereby reducing the amount of leachate production and migration; (2) preventing access to the landfill waste material; and (3) preventing erosion of cover material and exposure of buried waste. Use of the soil cap system associated with Alternatives #3c and #3d would similarly prevent access to landfill waste and exposure of buried waste but is not as effective as the multi-layer cap in minimizing infiltration, and therefore leachate production.

The gas venting system associated with the multi-layer cap system alternatives is more efficient than that of the soil cap system alternatives due to the presence of a geocomposite gas venting layer. In addition, any landfill gas trapped below the geomembrane hydraulic barrier of the cap and subsequently collected by the geocomposite venting layer is conveyed via least resistance to the up-gradient gas vent. Since landfill gas will move from areas of high pressure to areas of low pressure, any build- up of landfill gas in the subsurface, even under slight pressure, would begin to migrate towards the vertical gas vents.

The gas management system associated with the use of either cap system would require periodic monitoring, inspection, and maintenance to ensure its integrity, performance, and long-term reliability. Institutional controls would prohibit and/or regulate future use of the landfill property in order to protect the integrity of the cap system.

Alternatives #2c, #2d, #3c, and #3d are highly effective at reducing Site risks since they collect the leachate/groundwater before it migrates from the landfill. Alternatives #2c and #3c would be effective provided the Low Moor WWTP is operated efficiently and within VPDES requirements and the necessary upgrades are made to the plant. Alternative #2c would provide greater long-term effectiveness than Alternative #3c since it reduces leachate to the maximum extent possible. Alternatives #2d and #3d would be effective provided the

Leachate Treatment Plant ("LTP") is operated in compliance with VPDES requirements. Alternative #2d would provide greater long-term effectiveness and permanence than Alternative #3d due to the reduced leachate associated with a multi-layer cap.

It is expected that the control of Site- related contaminants at the source along with ongoing biological processes could address remediation of groundwater contaminants. Monitoring of groundwater would be a component of all alternatives being considered for the Site.

<u>Reduction of Toxicity, Mobility, and Volume Through Treatment</u>:

Section 121(b) of CERCLA, 42 U.S.C. § 9621(b), establishes a preference for remedial actions which include treatment that permanently and significantly reduces the toxicity, mobility, or volume of contaminants.

Alternatives #2c, #2d, #3c, and #3d include components to contain and treat contaminated leachate/groundwater. Therefore, to differing degrees, reduction of toxicity, mobility, and volume of the landfill leachate is accomplished. For Alternatives #2c and #2d, reduction in volume of toxic materials is accomplished by reducing leachate production to the maximum extent possible through use of a multi-layer cap system. In Alternatives #3c and #3d there is less reduction in volume of toxic materials since a soil cap system does not reduce leachate production to the extent that a multi-layer cap would.

Alternatives #2c, #2d, #3c, and #3d all achieve significant decreases in the toxicity and mobility of the leachate/groundwater by providing treatment at either an on- Site or off-Site treatment facility.

<u>Short-Term Effectiveness</u>:

Implementation of any of the alternatives would require all workers to meet the requirements of 29 C.F.R. § 1910.120, which pertains to training and medical monitoring. Engineering controls such as dust controls, Personal Protective Equipment ("PPE"), monitoring, work zones, decontamination facilities, etc. would be implemented as necessary to protect workers in accordance with a site- specific Health and Safety Plan (" HASP") during implementation of any alternative. Other hazards to workers are related to standard construction risks and would be addressed using standard safety practices.

Alternatives #2c, #2d, #3c, and #3d would not subject construction workers to any unacceptable risks. Short-term health risks associated with methane, dust, and VOCs during trench construction can be minimized by maintaining work zones, using PPE, engineering controls, and air monitoring. Alternatives #2d and #3d involve the construction and operation of an on-Site Leachate Treatment Plant; potential exposure by remediation contractors to contaminants during plant startup can be mitigated by using appropriate PPE.

<u>Implementability</u>:

Alternatives #2c, #2d, #3c, and #3d are equally implementable. The expertise, labor force, supplies, and equipment needed to effectively implement these alternatives are readily available. Major engineering, administrative, and construction difficulties are not anticipated. The multilayer cap and soil cap are common landfill remedies and can be readily engineered and constructed. No permits would be necessary for on-Site activities because the Site would be remediated under the CERCLA program. Access agreements and easements may be required with CSX if stormwater management controls are required on the north side of Route 696 (to be determined during remedial design). Refinements would be made during remedial design to ensure that treatment of the leachate would not adversely impact the LMWWTP. This may include bench scale/pilot studies. Alternatives #2d and #3d may also require some bench scale/pilot studies to refine/optimize the Leachate Treatment Plant system.

The groundwater monitoring component of the alternatives is easily implemented. Monitoring equipment such as wells, pumps, containers, and laboratory services used during sampling are readily available.

Costs:

Evaluation of costs of each alternative generally includes the calculation of direct and indirect capital costs and the annual operation and maintenance ("O&M") costs, both calculated on a present worth basis. An estimated capital, annual O&M and total present worth cost for each of the alternatives has been calculated for comparative purposes and is presented in Table 22.

Table 22
Summary of Estimated Costs

	Capital Cost	Annual O&M Cost	Present Worth Cost
Alternative #2c	$7,345,000	Years 1-5: $212,783 Years 6-30; $196,033	$9,847,000
Alternative #2d	$6,971,000	Years 1-5: $322,000 Years 6-30: $305,250	$10,828,000
Alternative #3c	$5,497,000	Years 1-5: $244,000 Years 6-30; $227,250	$8,386,000
Alternative #3d	$5,527,000	Years 1-5: $472,000 Years 6-30: $455,250	$11,245,000

Direct capital costs include costs of construction, equipment, building and services, and waste disposal. Indirect capital costs include engineering expenses, start-up and shutdown, and contingency allowances. Annual O&M costs include labor and material; chemicals, energy, and fuel; administrative costs and purchased services; monitoring costs; cost for periodic Site review (every five years); and insurance, taxes, and license costs. For cost estimation purposes, a period of 30 years has been used for O&M. In reality, maintenance of a site with waste left in place would be expected to continue beyond this period. The actual cost for each alternative is expected to be in a range from 50 percent higher than the costs estimated to 30 percent lower than the costs estimated. A seven percent discount rate was used in present worth calculations in accordance with EPA guidance.

Detailed costs estimates, including assumptions used, are provided in the Administrative Record.

State Acceptance:

The Commonwealth of Virginia supports the selected alternative described below.

Community Acceptance:

Comments received during the public comment period were generally supportive of EPA's recommendations for remediation. Specific comments on the Proposed Plan are addressed in detail in the Responsiveness Summary which is a part of this ROD.

XI. PRINCIPAL THREAT WASTES

The NCP, at 40 C.F.R. § 300.430(a)(l)(iii)(A), establishes an expectation that EPA will use treatment to address the principal threats posed by a site, whenever practicable. "Principal threat" wastes are generally defined as source materials (contaminated materials that acts as a reservoir for migration of contamination to groundwater, surface water, or air, or acts as a source for direct exposure) considered to be highly toxic or highly mobile such that risks from such materials cannot effectively reduced through containment, or which would present a significant risk to human health or the environment should exposure occur.

EPA does not consider any of the wastes at the Kim Stan Superfund Site to be "principal threat" wastes.

XII. SELECTED REMEDY AND PERFORMANCE STANDARDS

Following consideration of the requirements of CERCLA, a detailed analysis of the alternatives using the nine criteria set forth in the NCP, and careful review of public comments, EPA has selected **Alternative # 2c: Multi-Layer Cap; Groundwater Monitoring; Leachate Control by New Collector Trench/Barrier Wall, Pump and Treat, and Discharge to POTW; and Institutional Controls** for implementation at the Kim Stan Landfill Site.

A. Summary of the Rationale for the Selected Remedy

Alternatives #2c and #2d incorporate an engineered multi-layered landfill cap which will nearly eliminate vertical infiltration and greatly reduce the volume of leachate that will need to be managed. Alternatives #3c and #3d incorporate a soil cap which will require a larger volume of leachate to be managed. Alternatives #2c and #3c convey the collected leachate to the Low Moor waste water treatment plant while Alternatives #2d and #3d require the construction and operation of a leachate treatment plant on-Site. The selected remedy (Alternative #2c) provides better long term effectiveness and has a higher degree of implementability than the other alternatives considered because the remedy offers the most certain control and fewest unknowns associated with effective implementation. EPA has a high level of confidence that the volume of leachate created within the landfill will be reduced and that the leachate collected from the landfill will be effectively treated at the Low Moor waste water treatment plant as a routine influent. The high variance in leachate flow rate and the higher leachate volume to be managed combined with the administrative difficulty associated with operating a small waste water treatment plant on-Site over the long-term decreases the relative merit of the other alternatives evaluated. In addition, it is plausible that over time the low permeability cap included in the selected remedy, coupled with the recently completed project which diverts clean storm water around the landfill, will reduce the quantity of leachate generated to the point that collection and treatment of leachate may no longer be necessary. **3**

B. Description of the Selected Remedy and Performance Standards

The selected remedy shall provide for a Multi- Layer Cap; Groundwater Monitoring; Leachate Control by New Collector Trench/ Barrier Wall, Pump and Treat, and Discharge to POTW; and Institutional Controls to reduce risks presented by the Kim Stan Landfill Site to acceptable levels, as further described below. The following are the key components of the selected remedy as well as the Performance Standards associated with such components:

1. ***Landfill wastes visible at the surface of the ground outside the Kim Stan Landfill property boundary (including all such waste within the right-of-way of Route 696) shall be consolidated into the landfill no less than fifty (50) feet from the edge of the landfill property boundary.***

3 Cost estimates utilized in the comparative analysis assume that leachate will be collected and treated for the 30 years.

All landfill wastes visible at the ground surface but outside the Kim Stan Landfill property boundary, including wastes within the Route 696 right-of-way, shall be consolidated into the existing landfill prior to installation of the multi- layer cover. Clean backfill shall be used to restore excavated areas to their original grade. All waste consolidated into the landfill shall be placed within the landfill at least fifty (50) feet from the Kim Stan Landfill property boundary.

2. A leachate collection system shall be installed which shall prevent the migration of leachate from the landfill property and contain such leachate within the landfill property boundary in a manner that will allow for removal and treatment of the leachate at an off-Site facility.

(a) The leachate collection system shall provide for the collection of all leachate produced by the landfill. The leachate collection system shall prevent the migration of leachate from the landfill property and contain such leachate within the landfill property boundaries in a manner that will allow for removal and treatment of the leachate at an off-Site facility. The leachate collection system shall be operated and maintained until EPA determines, in consultation with the Commonwealth of Virginia, that leachate is no longer produced by the landfill.

(b) The existing landfill leachate underground storage tanks shall be removed and properly disposed. Existing stormwater/leachate control pipe lines and manholes used during operation of the landfill that are not incorporated into the remedy shall either be removed and properly disposed or abandoned in-place (e.g., filled with concrete).

(c) The new leachate collection system shall include a trench and barrier wall which shall prevent the migration of leachate from the landfill property and contain such leachate within the landfill property boundary in a manner that will allow for removal and treatment of the leachate at an off-Site facility.

(d) At a minimum, the trench shall be constructed along the northern landfill property boundary bordered by Route 696, and around portions of the east and west sides of the landfill so as to eliminate, or reduce to the maximum extent practicable, the potential for leachate to migrate around the barrier wall. The exact trench size and placement necessary to attain the above-described performance standard shall be finalized during design. The bottom of the trench shall key into the clay stratum on which the leachate is perched. Permeable gravel and perforated plastic pipe shall be placed within the trench. The depth to the top of gravel shall correspond to the depth to the top of leachate during the highest historical leachate level recorded during the RT. The gravel shall be wrapped in non-woven geotextile to prevent fine soil particles from clogging the stone and collection pipe. The remaining depth of the trench shall be backfilled with clean fill.

(e) At a minimum, the barrier wall shall be placed on the northern side of the trench between the landfill and Route 696, shall extend to the bottom of the trench, and shall be constructed using a 60-mil high density polyethylene liner so as to prevent the flow of leachate through the trench. The exact location and size of the barrier wall necessary to attain the above-described performance standard shall be finalized during design.

(f) Excess soils excavated from placement of the collector trench and barrier wall shall be placed below the multi-layer cap. Any waste encountered during installation of the collector trench and barrier wall shall be consolidated into the landfill no closer than 50 feet from the boundary of the landfill property.

Figure 15 depicts the conceptual location of the collector/barrier trench. The actual location, size, and materials used in construction shall be determined during remedial design.

3. The collected leachate shall be conveyed to the Low Moor Waste Water Treatment Plant ("LMWWTP") for treatment, in accordance with CERCLA § 121(d)(3).

(a) All collected leachate shall be conveyed to the LMWWTP for treatment. All piping, pump stations, sanitary sewer lines, man holes, and associated components necessary to transport the collected leachate from the landfill to the LMWWTP shall be installed. The actual equipment, piping, and other materials used to convey the leachate to the LMWWTP, as well as the layout of the conveyance equipment, shall be determined during the design.

(b) The treatment plant shall be upgraded to ensure that the plant can treat all leachate conveyed from the landfill before discharging such waste. A conceptual diagram of the upgrade components that may be necessary is shown in Figure 17. The actual components and materials necessary for the upgrade shall be determined during the design phase. A treatability study shall be conducted to ensure that plant upgrades are adequate to enable successful treatment of all landfill leachate.

(c) The equipment necessary to convey the leachate to the LMWWTP for treatment, as well as the equipment necessary to treat the leachate, shall be operated and maintained until EPA determines, in consultation with the Commonwealth of Virginia, that the landfill is no longer producing leachate or that the leachate being generated by the landfill no longer contains contaminants of concern.

4. The landfill shall be covered with a multi-layer cap that shall eliminate, or reduce to the maximum extent practicable, the infiltration of water into the waste and the resulting production of leachate and groundwater contamination.

(a) Following consolidation of materials as described above, a multi-layer cover shall be installed which shall eliminate, or reduce to the maximum extent practicable, the infiltration of water into the waste and the resulting production of leachate and groundwater contamination. The multi-layer cap shall cover the area! extent of the waste, which shall be determined during design. The cover shall prevent direct contact with the landfill contents. The cover shall also prevent off- Site migration of contaminants via surface water.

(b) The cover shall be designed, constructed, and maintained to meet all ARARs including, but not limited to, RCRA regulations found at 40 C.F.R. Part 258, Subparts E and F; Virginia Solid Waste Management Regulations found at 9 VAC 20-80-250(D), 9 VAC 20-80-250(E), 9 VAC 20-80-250(F), 9 VAC 20-80-280, 9 VAC 20-80-290, and 9 VAC 20-80-310; and the performance requirements of the following EPA technical guidance documents: "Final Covers on Hazardous Waste Landfills and Surface Impoundments" (EPA/530-SW-89-047, July 1989); "Design and Construction of RCRA/CERCLA Final Covers" (EPA/625/4-91/025, May 1991); and "Construction Quality Management for Remedial Action and Remedial Design Waste Containment Systems" (EPA/540/R-92/073, October 1992).

(c) The cover shall be designed to minimize infiltration, control surface water run on/runoff, and provide for the release of landfill gas (if necessary to protect the cap and prevent the uncontrolled release of landfill gasses). In addition, the cover shall be designed and constructed as follows:

1. An engineered surface water drainage and erosion control system which includes drainage channels shall be constructed to prevent erosion of the cover, control surface water runoff, and promote positive drainage. The system will include surface grading and storm water retention basins and outfall structures, as necessary.

2. The top layer of the cover shall consist of two components: (1) a vegetated or armored surface component selected to minimize erosion and, to the extent possible, promote drainage from the cover, and (2) a soil component with a minimum thickness of 24 inches comprised of topsoil and/ or fill soil, as appropriate, the surface of which slopes in a manner that will promote positive drainage. A soil component of greater thickness may be required to assure that the underlying low-permeability layer is below the frost zone and

plant life can be maintained.

3. A drainage layer shall be installed above the synthetic barrier to allow water to drain off the synthetic barrier and to prevent the ponding of water over the synthetic barrier. If this layer is soil, it shall have a minimum thickness of 30-cm (12 inch) with a minimum hydraulic conductivity of 1 x 10-2 cm/sec and a minimum transmissivity of no less than 3 x 10-5 m2/sec. This layer, intended to minimize water infiltration into the low hydraulic conductivity layer, shall have a final slope of at least 3 percent after settlement and subsidence. The drainage layer may be comprised of a geosynthetic material having the above-described hydraulic characteristics.

4. The low hydraulic conductivity layer shall be a synthetic barrier. This will be the main barrier which prevents water infiltration from entering the landfill. This synthetic barrier shall be a type of flexible geomembrane at least 40 mil thick and have an infiltration rate no greater than IE-7 cm/sec. Selection of the material to be used for the low hydraulic conductivity layer shall be made during the design.

5. The bedding layer shall be the first layer placed over the landfill area and consist of a minimum 12-inch thick compacted soil layer. The soil in this layer shall provide a workable graded surface on which to construct the remaining layers of the cover system and shall separate the overlying cap system from potentially damaging solid waste materials.

6. A gas management layer shall be installed to allow for the release of landfill gas.

7. The cover shall be designed to maximize the use of vegetation to reduce leachate volumes through evaporation of water from soils and plant leaves.

(d) The cover shall be maintained for a period of 30 years from construction completion, or such other time period as EPA, in consultation with VDEQ, determines to be necessary based on the statutory reviews of the remedial action conducted no less often than every five years.

(e) The Kim Stan Landfill property is currently enclosed by a fence. This fence shall be maintained to prevent unauthorized access to the landfill until the multi- layer cover is in place. Following completion of the cover, the fence may be reconfigured to enclose only those areas necessary to safe guard remedy components (e.g., gas vents).

5. Groundwater shall be routinely monitored to document progress in meeting the groundwater performance standards and to determine the need for continued limits on groundwater use.

The ground water monitoring well network will be comprised of a combination of existing and new monitoring wells established to document the remedy's progress in meeting the groundwater performance standards (this includes wells needed to establish background groundwater conditions) and to enable EPA to determine the need for continued limits on groundwater use. The monitoring frequency shall be quarterly for the first three years from construction completion and shall include, at a minimum, monitoring for metals, pesticides, PCBs, semi-volatile organic compounds, and volatile organic compounds. The frequency of monitoring, as well as the parameters monitored, may be modified by EPA, in consultation with the Commonwealth of Virginia. All monitoring wells shall be designed, installed, maintained, and abandoned in accordance with the substantive provisions of applicable State and Federal regulations (see Table 21). Monitoring shall continue until EPA, in consultation with the Commonwealth of Virginia, determines that the groundwater performance standards (see below) have been met and there is no longer any need to restrict use of the groundwater.

6. Institutional controls shall be implemented to protect the integrity of the remedy and to prevent use of contaminated groundwater.

(a) Institutional controls shall be implemented to protect the integrity of the multi-layer cover, leachate collection system, and other remedy components on the Kim Stan Landfill property. Such controls shall remain in place for as long as the multi- layer cover, leachate collection system, and other remedy components are required to be operated and maintained. The institutional controls shall prevent activities which could interfere with the operation and maintenance, function, or the integrity of the remedy.

(b) In addition, institutional controls shall be implemented at the landfill property, within a 200 foot buffer around all sides of the landfill property, and between the northern edge of this buffer-enlarged area and the Jackson River to prevent use of groundwater for drinking, bathing, or cooking until the groundwater performance standards are attained (see Figure 14 for an illustration of the area where such controls are required). The groundwater performance standards are the more stringent of:

- non-zero Federal Maximum Contaminant Level Goals ("MCLGs");
- Federal Maximum Contaminant Levels ("MCLs");
- State MCLs; and
- existing groundwater standards promulgated by Virginia

adjusted downward (more stringent) as necessary to ensure that the cumulative effect of contamination in groundwater will not result in a cancer risk greater than 1 in 100,000 or a Hazard Index greater than 1.0, for thallium, arsenic, and vinyl chloride, provided that the performance standard for any such contaminant shall not be below the background concentration. **4** EPA expects that using source controls as provided under this alternative will achieve attainment of the performance standards within a 15 year period and that the groundwater will be suitable for unlimited use once the performance standards have been met.

C. Summary of Estimated Remedy Costs

The estimated capital costs of the selected remedy is $7,345,000. The estimated present worth annual cost of operation and maintenance ("O&M") for years one through five is $212,783, and $196,033 for years six through thirty. O&M costs are based on a 30-year O&M period. The estimated net present worth cost of the selected remedy is $9,847,000.

The information in this cost estimate summary is based on the best available information regarding the scope of the selected remedy. Cost variations are likely to occur as new information and data are collected during the design phase. This is an order-of-magnitude engineering cost estimate that is expected to be within +50 to -30 percent of the actual project cost. Table 19 contains a detailed breakdown of estimated costs.

4 The BLRA also identified iron and manganese, which (1) are not hazardous substances, and (2) are not associated with a non- zero MCLG, Federal or State MCL, or Virginia groundwater standard, as contaminants of concern presenting an unacceptable risk to human health and the environment. EPA anticipates that attainment of the above- described performance standard for thallium, arsenic, and vinyl chloride will reduce to acceptable levels the risk presented by all Site-related contaminants of concern.

D. Expected Outcomes of the Selected Remedy

The selected remedy will reduce, to acceptable levels, risks to human health and the environment presented by the Kim Stan Landfill Superfund Site by covering the landfill to prevent or minimize the production of landfill leachate; collecting, removing, and treating landfill leachate at an off-Site treatment plant; and implementing controls to prevent use of contaminated groundwater. EPA expects that, following implementation of the selected remedy, groundwater that has been impacted by leachate from the landfill will be restored to drinking water standards within 15 years. Use restrictions on such groundwater are part of the selected remedy and will be in place until the groundwater performance standards are attained. Use of the landfill property will be indefinitely limited to ensure that the multi-layer cover continues to prevent the creation of new leachate that could be released into the groundwater.

XIII. STATUTORY DETERMINATIONS

Under section 121 of CERCLA and the NCP, the lead agency must select remedies that are protective of human health and the environment, comply with applicable or relevant and appropriate requirements (unless a statutory waiver is justified), are cost-effective, and utilize permanent solutions and alternative treatment technologies or resource recovery technologies to the maximum extent practicable. In addition, CERCLA includes a preference for remedies that employ treatment and that permanently and significantly reduce the volume, toxicity, or mobility of wastes as a principal element and a bias against off-site disposal of untreated wastes. The following sections discuss how the selected remedy meets these statutory requirements.

A. Protection of Human Health and Environment

The selected remedy will protect human health and the environment by controlling exposures to human receptors through treatment (e.g., treatment of the landfill leachate at the LMWWTP), engineering controls (e.g., multi-layer cover to prevent infiltration of water into the waste and the creation of new leachate, and a leachate collection system to prevent leachate from migrating from the landfill), and institutional controls (e.g., restrictions on use of groundwater). Implementation of the selected remedy will reduce risks to human health presented by the release and threatened release of hazardous substances from the Site to acceptable levels. The selected remedy is also expected to further reduce ecological risk (which has been determined to be insignificant).

B. Compliance with Applicable or Relevant and Appropriate Requirements

The selected remedy will comply with all Federal and State requirements, standards, criteria, and limitations that are applicable or relevant and appropriate, as required by section 121(c) of CERCLA, 42 U.S.C. § 9621(c). Such requirements, standards, criteria and limitations are identified in Table 21.

C. Cost Effectiveness

Section 300.430(f)(l)(ii)(D) of the NCP, 40 C.F.R. § 300.430(f)(l)(ii)(D) requires EPA to evaluate cost-effectiveness by comparing all the alternatives meeting the threshold criteria--protection of human health and the environment and compliance with ARARs--against long-term effectiveness and permanence; reduction of toxicity, mobility or volume through treatment; and short-term effectiveness (collectively referred to as "overall effectiveness"). The NCP further states that overall effectiveness is then compared to cost to ensure that the remedy is cost effective and that a remedy is cost effective if its costs are proportional to its overall effectiveness.

EPA concludes, following an evaluation of these criteria, that the selected remedy is cost-effective in providing overall protection in proportion to cost and meets all other requirements of CERCLA. The estimated present worth cost for the selected remedy is

$9,847,000.

D. Utilization of Permanent Solutions and Alternative Treatment Technologies (or Resource Recovery Technologies) to the Maximum Extent Possible

The selected remedy represents the maximum extent to which permanent solutions and alternative treatment technologies (or resource recovery technologies) can be utilized in a practicable manner at the Site. Of those alternatives that are protective of human health and the environment and comply with ARARs (Alternatives #2c, #2d, #3c, and #3d), EPA has determined that the selected remedy offers the best balance of tradeoffs in terms of the five balancing criteria, while also considering the statutory preference for treatment as a principal element and the bias against off-site treatment and disposal.

E. Preference for Treatment as a Principal Element

The selected remedy satisfies the statutory preference for treatment as a principal element in that the remedy requires the treatment of the landfill leachate.

F. Five-Year Reviews Requirements

Section 121(c) of CERCLA and section 300.430(f)(4)(ii) require review of the remedy if the remedy results in hazardous substances, pollutants, or contaminants remaining on-site above levels that allow for unlimited use and unrestricted exposure, and specify that such review shall be conducted no less often than every five years after initiation of the remedial action.

Because hazardous substances will remain at the Kim Stan Landfill Site, the review described by section 121(c) of CERCLA and section 300.430(f)(4)(ii) of the NCP will be conducted no less often than every five years after initiation of the remedial action.

XIV. DOCUMENTATION OF SIGNIFICANT CHANGES

The Proposed Plan for the Kim Stan Landfill Superfund Site was released for public comment on July 24, 2002. The Proposed Plan identified as EPA's preferred alternative the alternative that is selected in this ROD for implementation at the Site. The remedy selected in this ROD involves no significant changes to the preferred alternative identified in the Proposed Plan.

RESPONSIVENESS SUMMARY
KIM STAN LANDFILL SUPERFUND SITE
SELMA, ALLEGHANY COUNTY, VIRGINIA

This Responsiveness Summary documents public comments expressed to EPA on the Proposed Remedial Action Plan for the Kim Stan Landfill Site ("Site") and EPA's responses to those comments. The information is organized as follows:

I. Overview

II. Comments received during the public meeting

III. Written comments received during the comment period

I. OVERVIEW

Pursuant to section 113(k)(2)(B) of the Comprehensive Environmental Response, Compensation, and Liability Act of 1980, as amended ("CERCLA"), 42 U.S.C. § 9613(k)(2)(B), EPA released, for public comment, the Proposed Remedial Action Plan ("Proposed Plan") setting forth EPA's preferred alternative for the Kim Stan Landfill Site on July 24, 2002. EPA made the Proposed Plan and other relevant documents available to the public in the Administrative Record file located at the EPA Region III Docket Room in Philadelphia, Pennsylvania; the Clifton Forge Public Library in Clifton Forge; Virginia, and electronically at http://www.epa.gov/arweb. The notice of availability of these documents was published in The Roanoke Times and The Virginian Review on July 24, 2002. A public comment period was held from July 24, 2002 to August 23, 2002. In July 2002, EPA issued a fact sheet and newspaper advertisements announcing the availability of the Proposed Plan and the date for the public meeting. EPA also notified the Kim Stan Advisory Committee of the date, time, and place of the public meeting. The July 2002 fact sheet discussed EPA's Preferred Alternative and solicited comments from all interested parties. In addition, EPA conducted a public meeting on July 30, 2002. At this meeting, EPA representatives answered questions about the Site and the remedial alternatives under consideration.

II. COMMENTS RECEIVED DURING THE PUBLIC MEETING

This section provides a summary of issues and concerns raised by attendees of the public meeting held on July 30, 2002. Several individuals provided oral comments at the public meeting. The comments, and EPA's responses, are summarized as follows.

1. Comment: The county engineer of Alleghany County read a prepared statement announcing his appreciation of the cooperative relationships Alleghany County has achieved with EPA and VDEQ since beginning work on this project, which has lead to significant progress toward cleaning up the Site. The county engineer further stated that Alleghany County wants to see the clean up proceed with all due haste and that they had outlined their concerns and conditions in a May 16, 2002, letter to EPA. The county engineer then requested that the letter be made part of the public record and presented a copy to the RPM.

EPA Response: The Agency extends its thanks to Alleghany County. The county's May 16, 2002 letter has been placed into the Administrative Record file. No further response is necessary.

2. Comment: The Kim Stan Advisory Committee Coordinator asked why EPA had initially indicated that sediment hot spot removal would be necessary, but did not include sediment hot spot removal in the Preferred Alternative presented in the Proposed Plan.

EPA Response: During preparation of the Proposed Plan, EPA's Biological Technical Assistance Group ("BTAG") reviewed all sediment analytical data in order to determine cleanup levels that would be applied to the removal of contaminated sediment. During that review, BTAG determined that while several PAHs, pesticides, and inorganic compounds exceeded initial ecological screening values, subsequent studies of sediment toxicity designed to assess this habitat did not indicate that sediments were toxic to Hyella azteca, a representative indicator sediment species. As a result, BTAG determined that sediment removal was not warranted and any actions taken in those areas would result in greater harm to the ecological environment that any realized benefits.

3. Comment: A commenter wanted to know who would be the owner of this property after the remedial action has been implemented.

EPA Response: Performance of response actions at the Kim Stan Landfill Site will not affect ownership of the property. The Alleghany County, Virginia land records reveal that Kim-Stan, Inc. is the current owner of the Site property. During EPA's investigation of ownership, the Agency learned that Kim-Stan, Inc. had been placed into Chapter 7 bankruptcy in May 1990; that the property was part of the bankruptcy estate intended for distribution by a Trustee appointed by the Bankruptcy Court; that the bankruptcy was closed in March 1994; that the property had not been sold, abandoned, or otherwise distributed by the Trustee; and that on September 13, 1994, the Commonwealth of Virginia issued a Notice of Termination of Corporate Existence advising Kim-Stan, Inc. that, as of September 1, 1994, Kim-Stan's corporate existence was terminated by operation of law for failure to pay the annual registration fees. Under Federal bankruptcy law, ownership of the property reverted back to Kim- Stan, Inc. at the close of the bankruptcy in March 1994 because the property had neither been abandoned nor sold by the Trustee debtor and administered for purposes of the bankruptcy law. Under Virginia law, control of the property passed to the directors of the former corporation at the time the Commonwealth of Virginia revoked Kim-Stan, Inc.'s corporate status. EPA's investigation further revealed that the property had not been sold or otherwise transferred following the completion of the Kim-Stan, Inc. bankruptcy in March 1994 or the revocation of corporate status by the Commonwealth of Virginia in September 1994 and that, as of the date of the termination of corporate status by the Commonwealth of Virginia, there were no corporate directors who would have assumed control of the property. As a result, EPA has not been able to identify anyone with authority to speak for Kim-Stan, Inc., the current landowner.

4. Comment: A commenter wanted to know if there has been any money collected from the landfill property owner.

EPA Response: No. Recovery of costs from the current owner (Kim-Stan, Inc.) is unlikely (see EPA Response to Comment # 3, above). But the Agency continues its work to identify other potentially responsible parties for purposes of obtaining reimbursement of cleanup costs and performance of work at the Site.

5. Comment: A commenter wanted to know how long the bankruptcy proceeding would continue in court.

EPA Response: According to EPA's investigation, the bankruptcy was discharged in March 1994. See the EPA Response to Comment #3 on this issue above.

6. Comment: A commenter asked for confirmation that there is a time limit on bankruptcy proceedings.

EPA Response: Bankruptcy proceedings can extend over many years. The Kim-Stan, Inc. bankruptcy was discharged in 1994. See the EPA Response to Comment #5, above.

7. Comment: The Kim Stan Advisory Committee Coordinator expressed support for EPA's preferred alternative on behalf of the Kim Stan Advisory Committee.

EPA Response: EPA appreciates the support of the Kim Stan Advisory Committee and the valuable input the Committee has provided during the investigation of the Site.

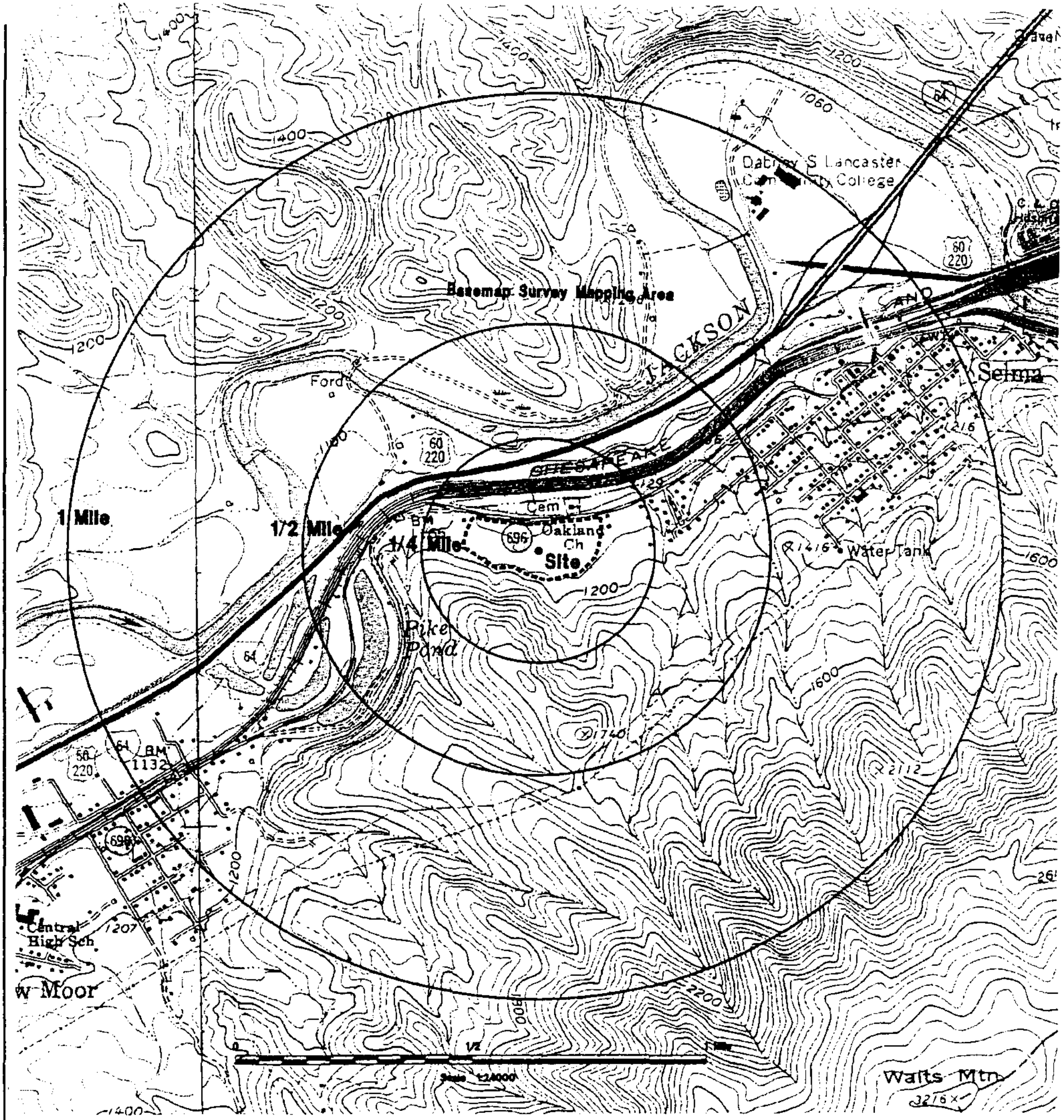
8. Comment: A commenter wanted to know if records kept by the community identifying where the trash trucks came from were passed on to EPA so that EPA could identify the out of state parties who contributed waste to the landfill.

EPA Response: EPA's investigation has produced numerous leads in this regard, though no community-based records have been discovered.

III. WRITTEN COMMENTS RECEIVED DURING THE COMMENT PERIOD

No written comments were received during the comment period.

ATTACHMENT/ENCLOSURES



Source: USGS 7.5 Minute Series (Topographic) Quadrangles: Clifton Forge, VA 1962 Photorevised 1986

Legend

Approximate Boundry of Landfill Source Area

N

QUADRANGLE LOCATION

Site Coordinates:
Longitude: -79 51 42 West
Latitude: 37 48 01 North

Date 3/10/2000

Figure 1
Location Map

T:\T47107\EPA-Slides2\PORTRAIT.dwg

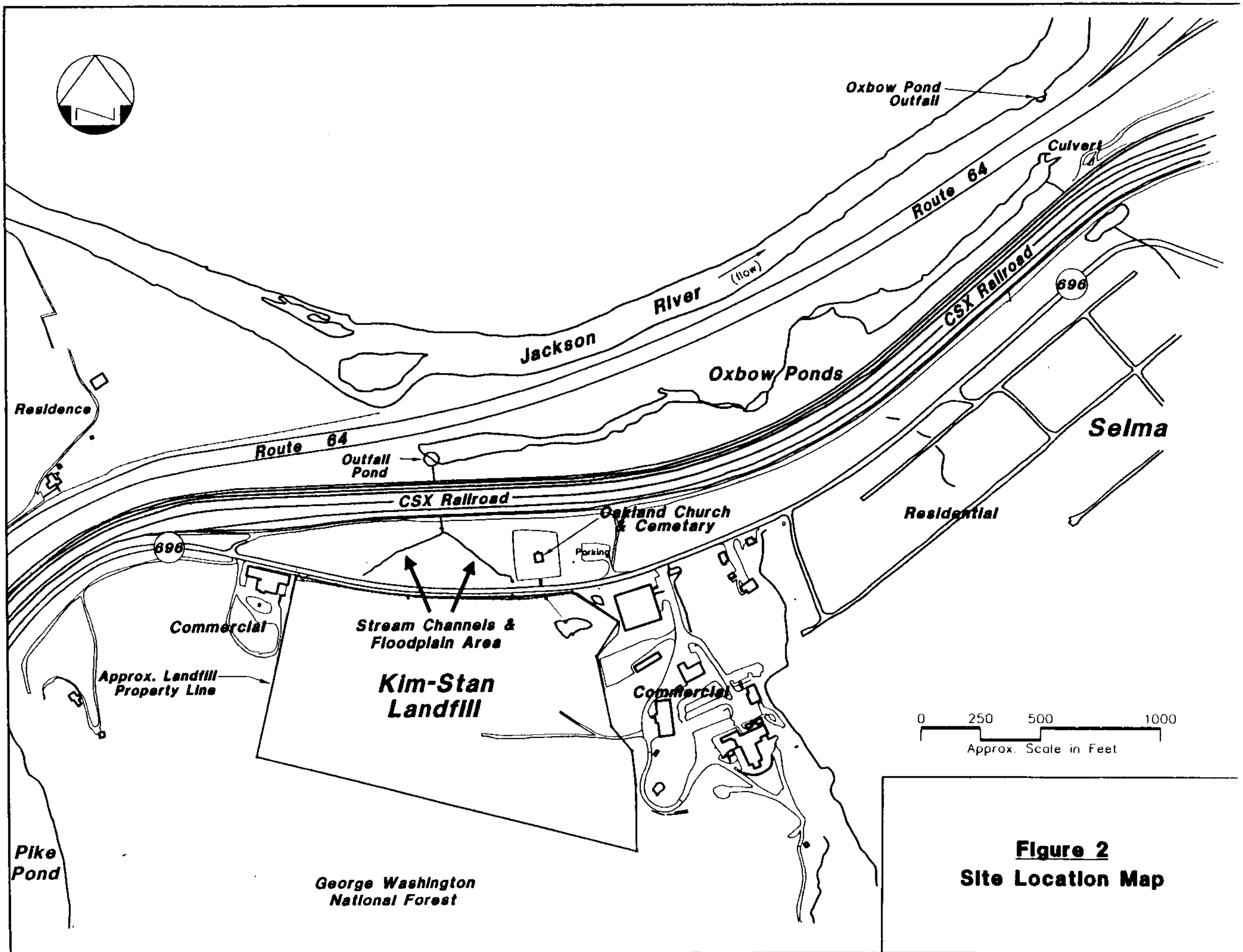


Figure 2
Site Location Map

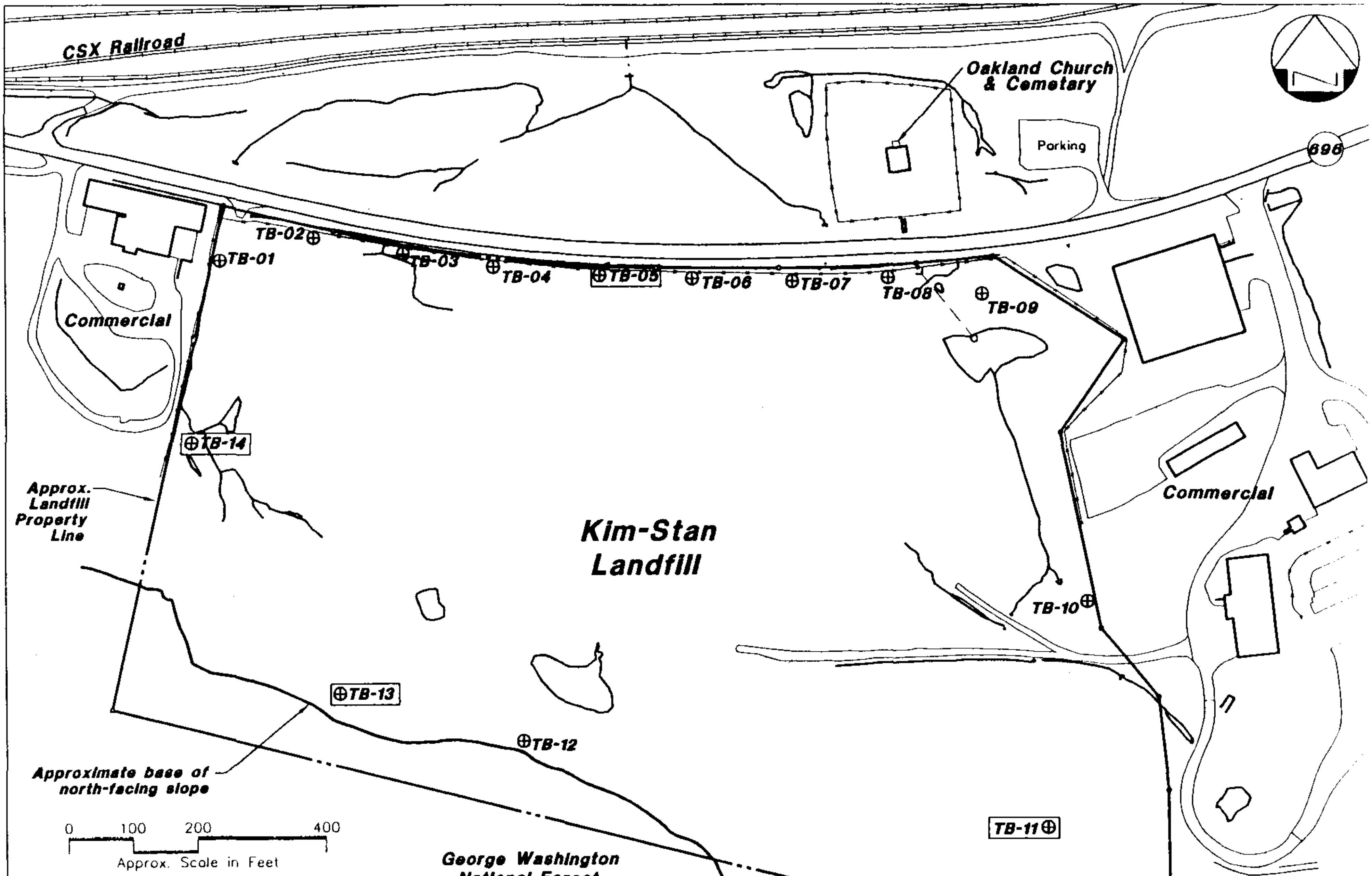
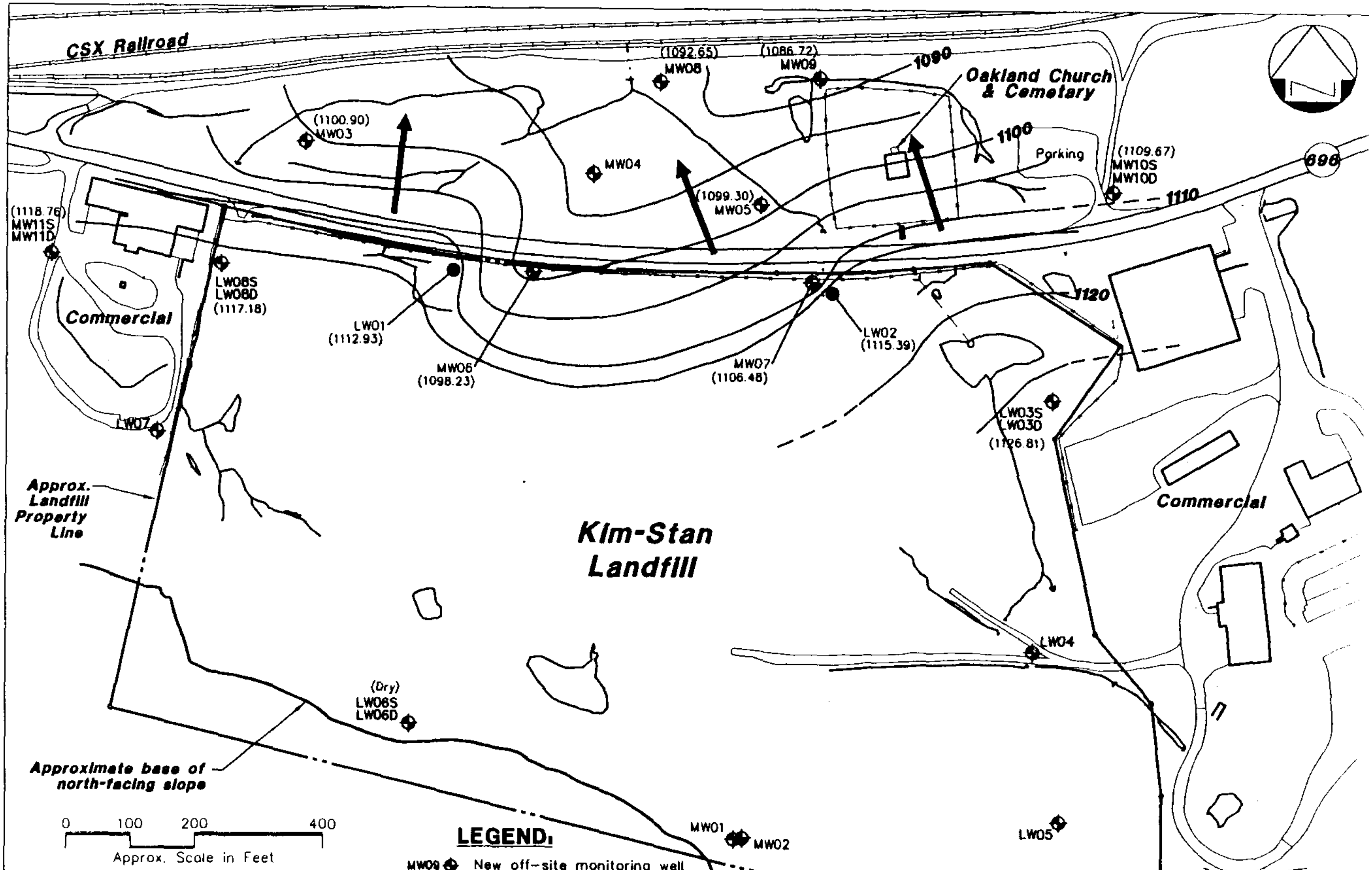


Figure 3
Test Boring Map & Packer Test Locations

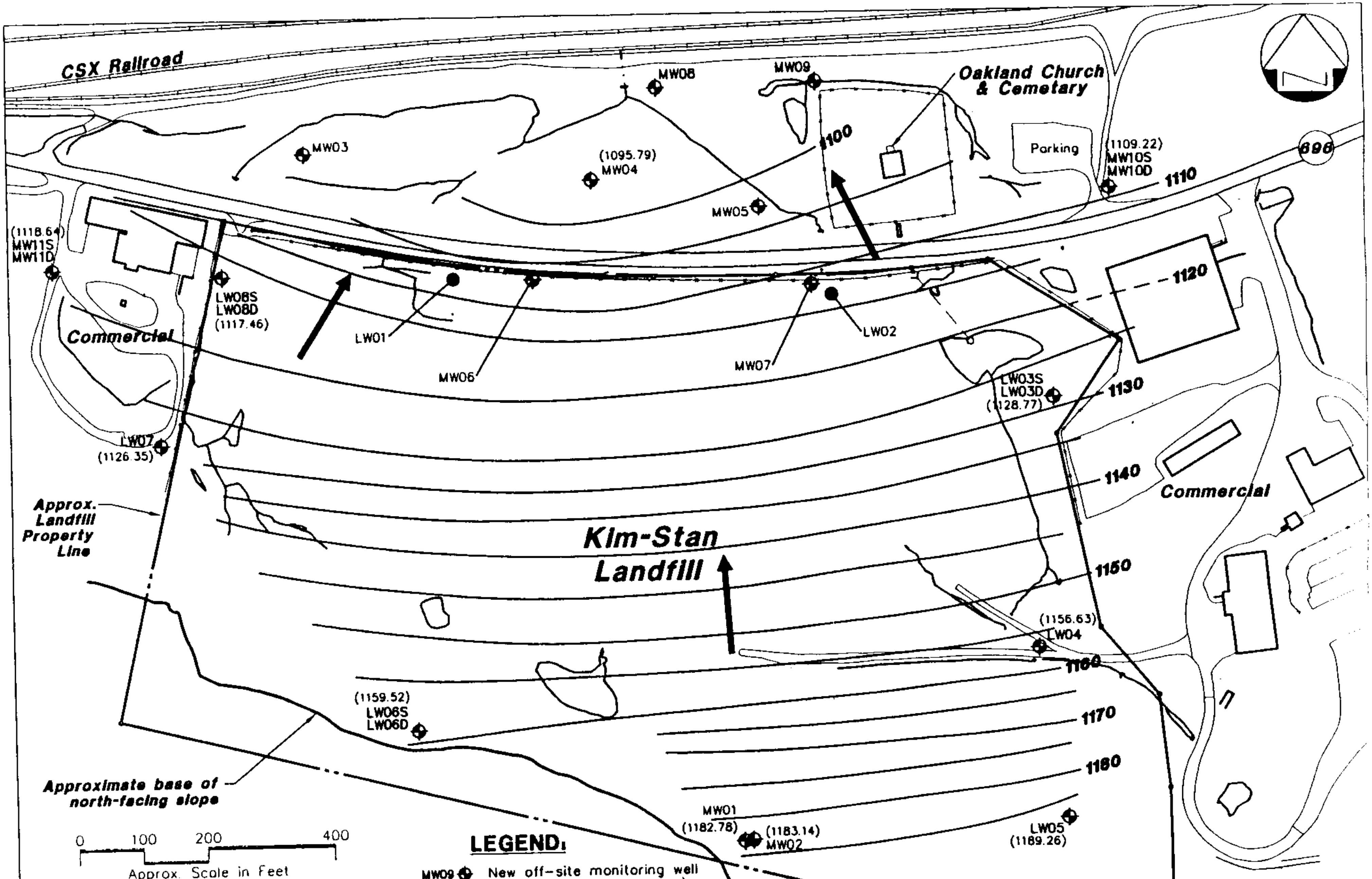


LEGEND:

- MW09 — New off-site monitoring well location (MW08 thru MW11) (MW10 & MW11 have Shallow & Deep wells)
- MW03 — Existing monitoring well location (MW01 thru MW07)
- LW03 — New leachate well (LW03 thru LW08) (LW03, LW06 & LW08 have Shallow & Deep wells)
- LW01 — Existing ~ 5 foot diameter open-top conc. "wells" associated w/ leachate collection system (LW01-LW02)
- (1100.90) MW03 — Shallow/Alluvial Well Water Elevations (2/16/01)
- 1120 — Shallow Aquifer GW Contour (5' contour interval)
- Ground Water Flow Direction

Figure 4

Shallow Aquifer Ground Water Surface Contours (2/16/01)



LEGEND:

- MW09 ⊕ New off-site monitoring well location (MW08 thru MW11) (MW10 & MW11 have Shallow &
- MW03 ⊕ Existing monitoring well location (MW01 thru MW07)
- LW03 ⊕ New leachate well (LW03 thru LW08) (LW03, LW06 & LW08 have Shallow & Deep wells)
- LW01 ● Existing ~ 5 foot diameter open-top conc. "wells" associated w/ leachate collection system (LW01–LW02)
- (1095.79) MW04 ⊕ Bedrock/Deep Well Water Elevations (2/16/01)
- 1120 —— Deep Aquifer GW Contour (5' contour interval)
- ➡ Ground Water Flow Direction

Figure 5

Deep Aquifer Potentiometric Surface Contours (2/16/01)

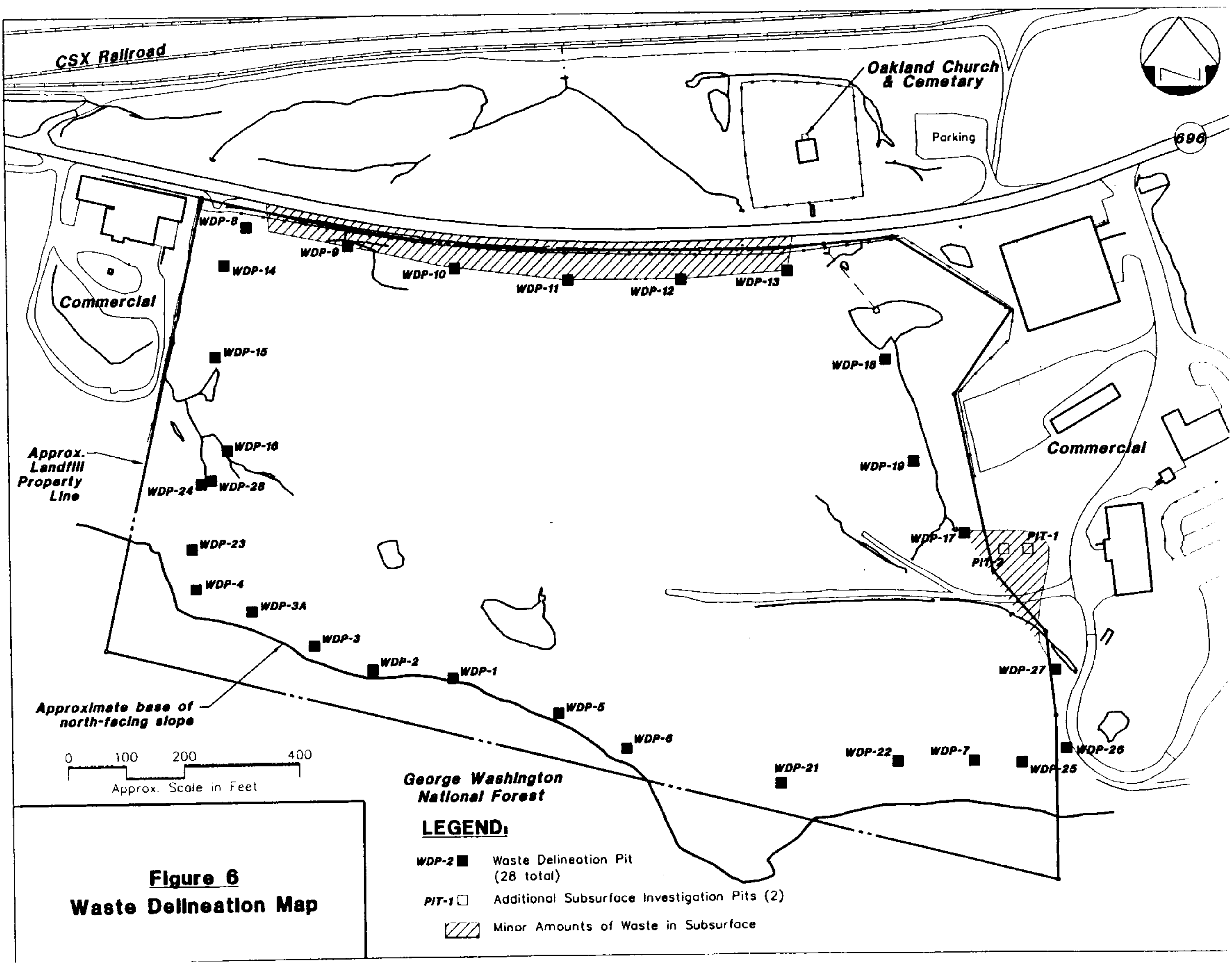


Figure 6
Waste Delineation Map

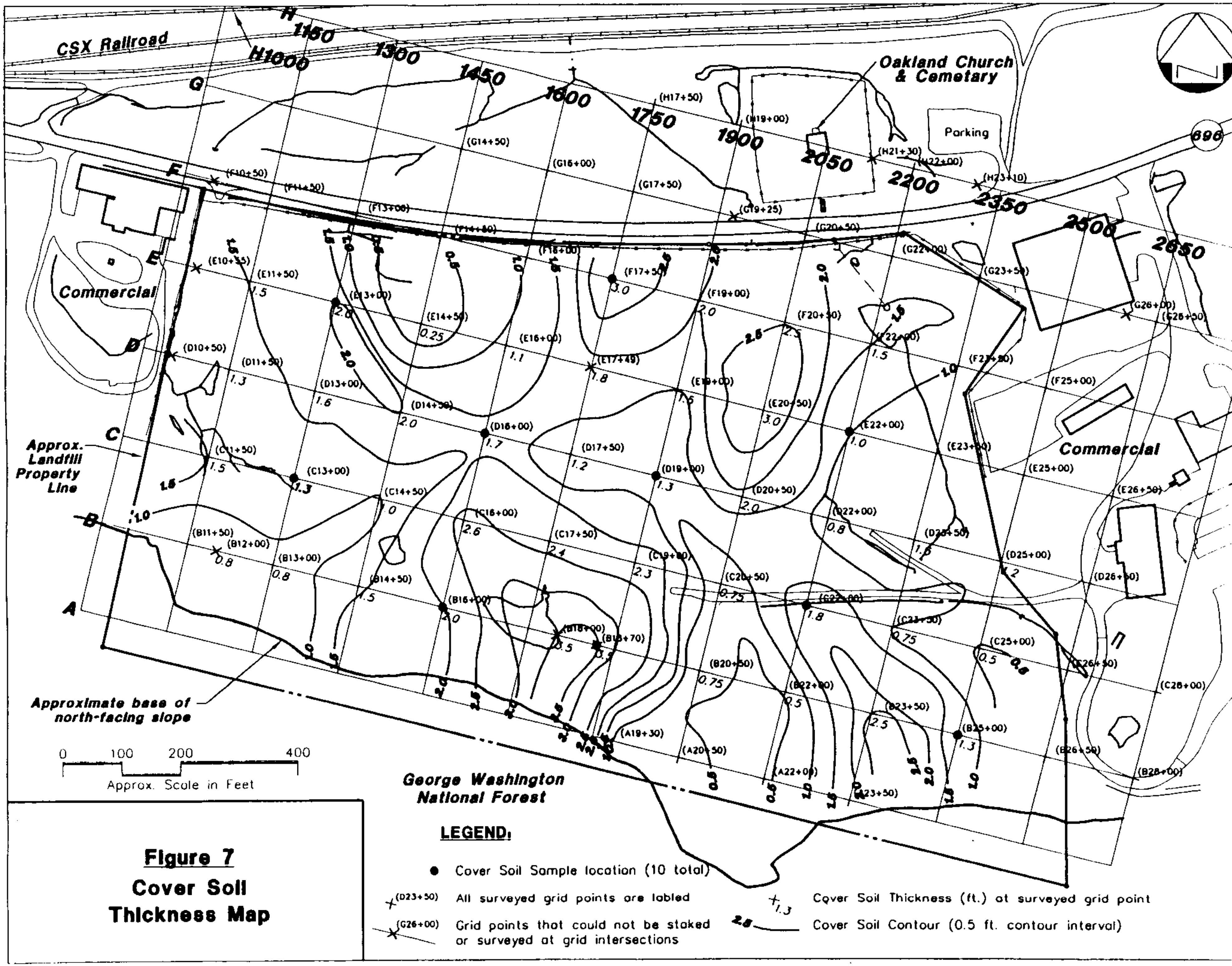


Figure 7
Cover Soil Thickness Map

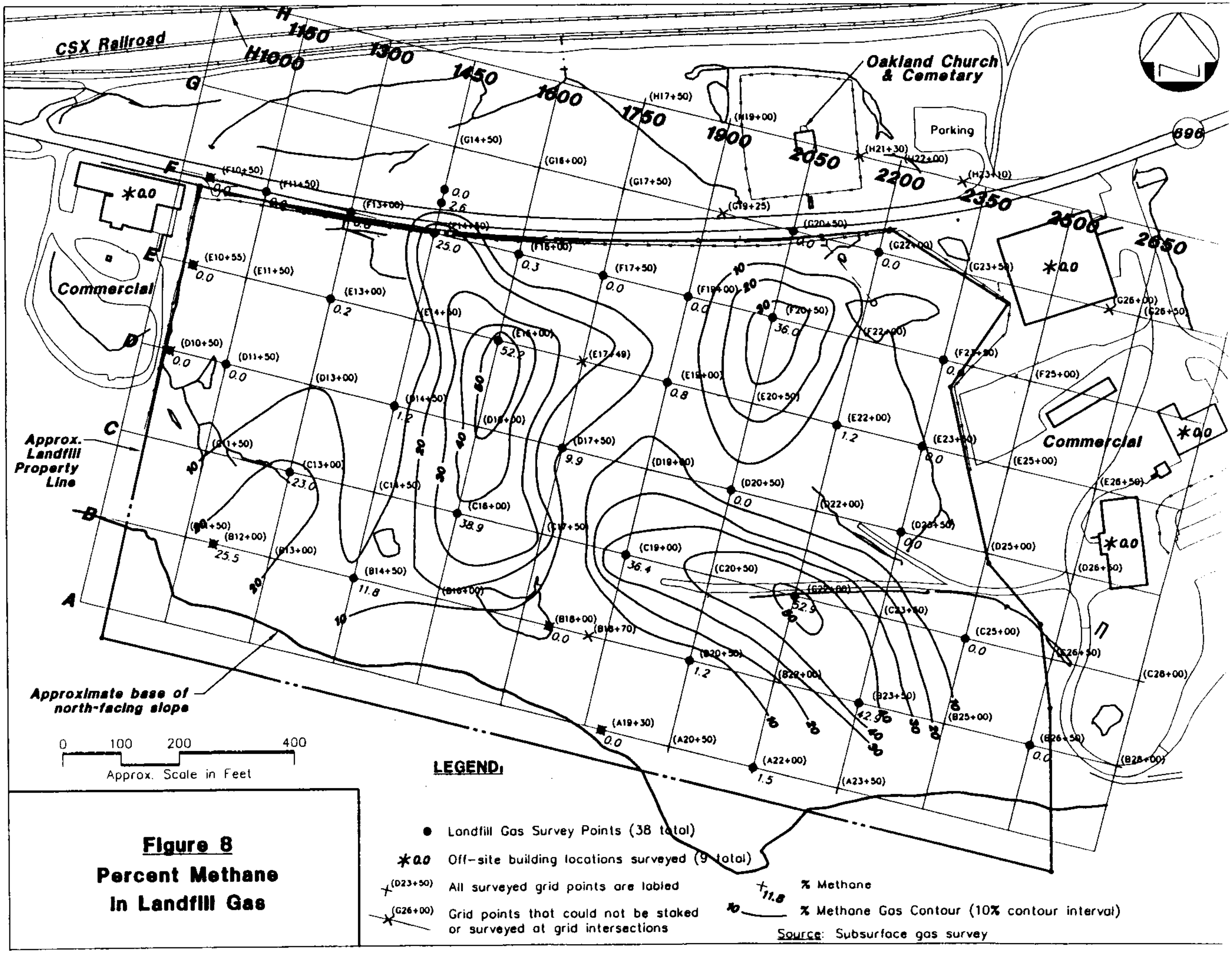
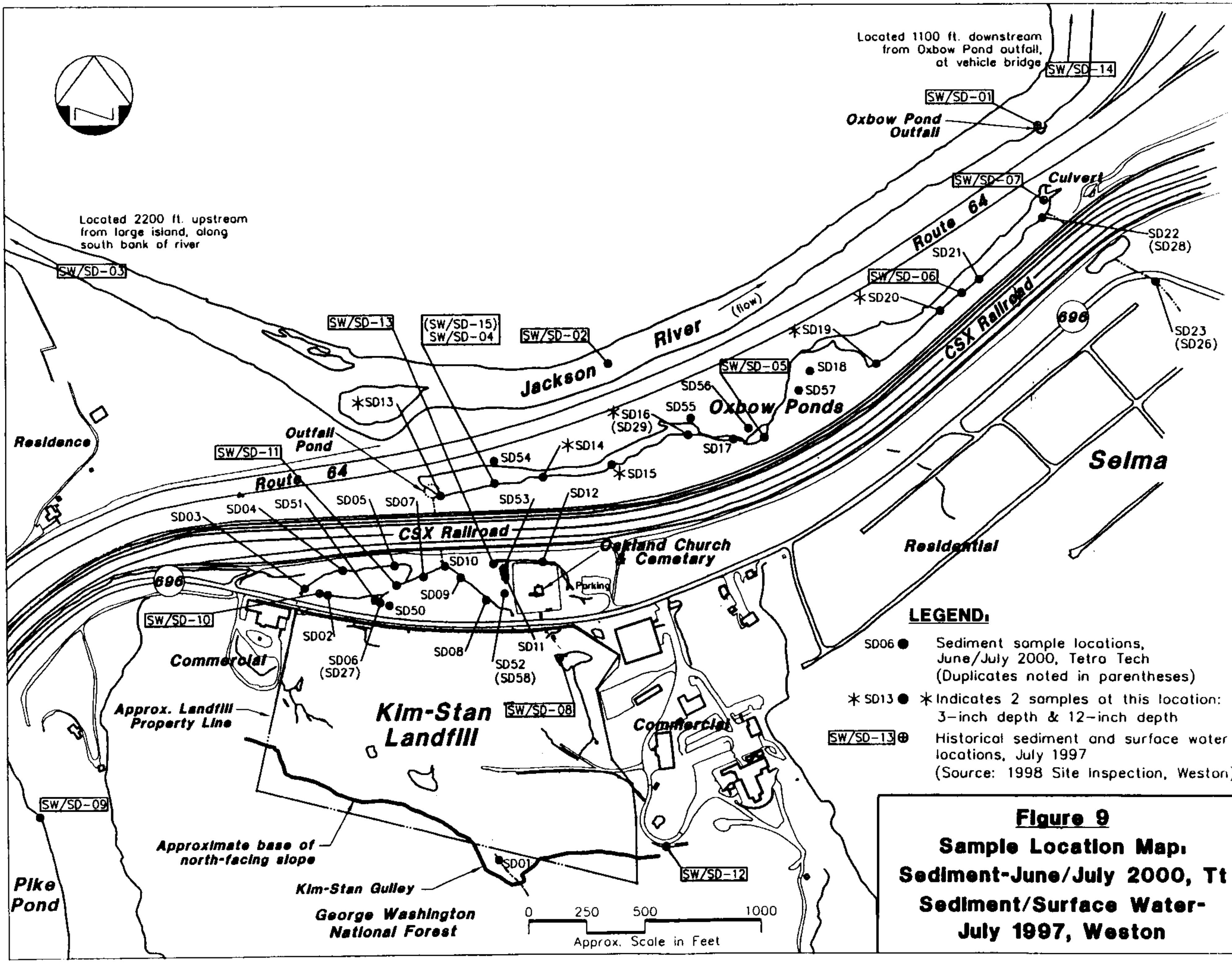


Figure 8
Percent Methane in Landfill Gas



LEGEND:

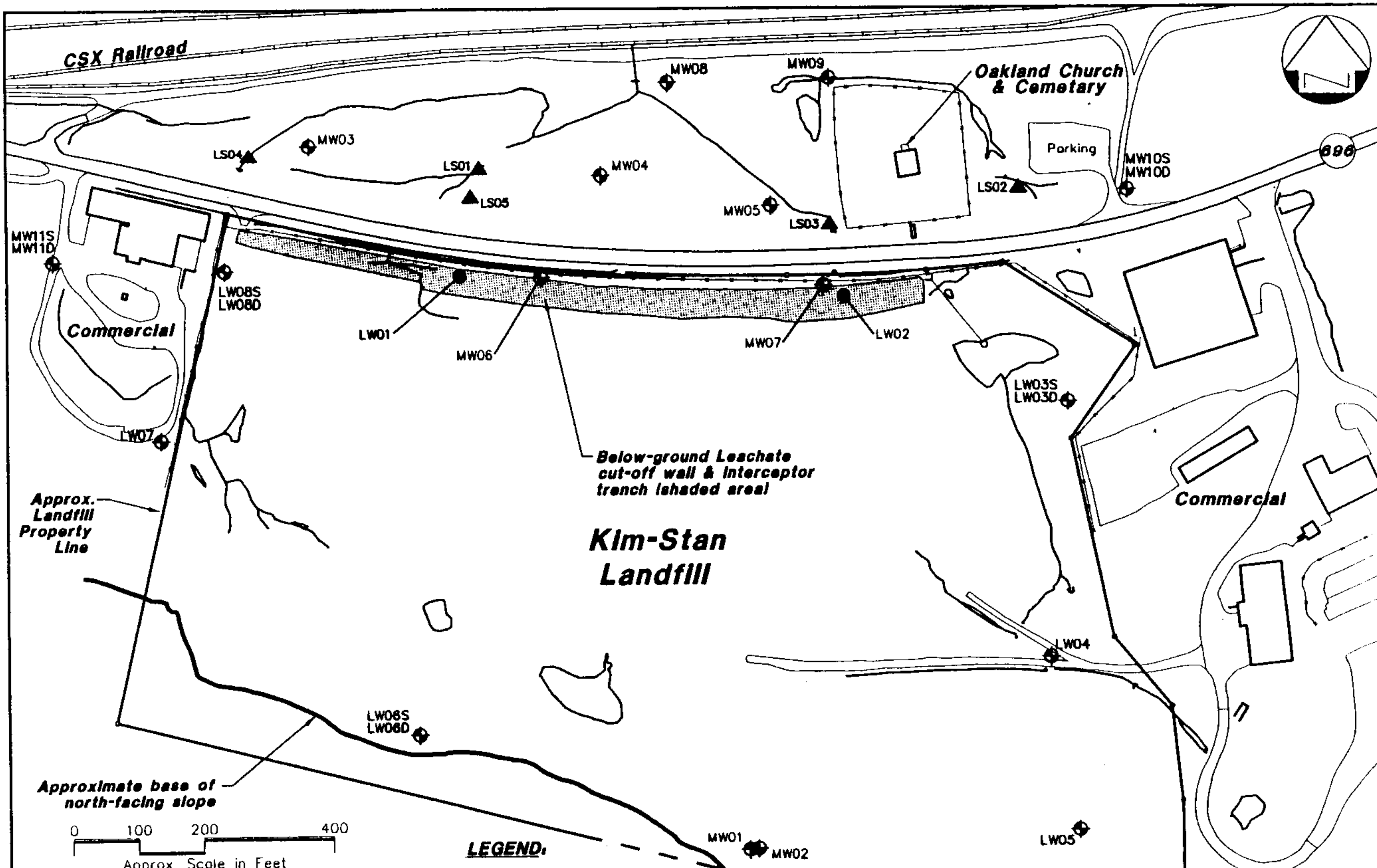
SD06 ● Sediment sample locations, June/July 2000, Tetra Tech (Duplicates noted in parentheses)

* SD13 ● * Indicates 2 samples at this location: 3-inch depth & 12-inch depth

SW/SD-13 ⊕ Historical sediment and surface water locations, July 1997 (Source: 1998 Site Inspection, Weston)

Figure 9

Sample Location Map: Sediment-June/July 2000, Tt Sediment/Surface Water-July 1997, Weston



LEGEND:

- MW09 ⊕ New off-site monitoring well location (MW08 thru MW11) (MW10 & MW11 = Shallow & Deep wells)
- MW03 ⊕ Existing monitoring well location (MW01 thru MW07)
- LW03 ⊕ New leachate well (LW03 thru LW08) (LW03, LW06 & LW08 = Shallow & Deep wells)
- LW01 ● Existing ~ 5 foot diameter open-top conc. "wells" associated w/ leachate collection system (LW01-LW02)
- LS03 ▲ Leachate seep sample location (LS01 thru LS05)

Figure 10

Leechate Seep Sample Location Map

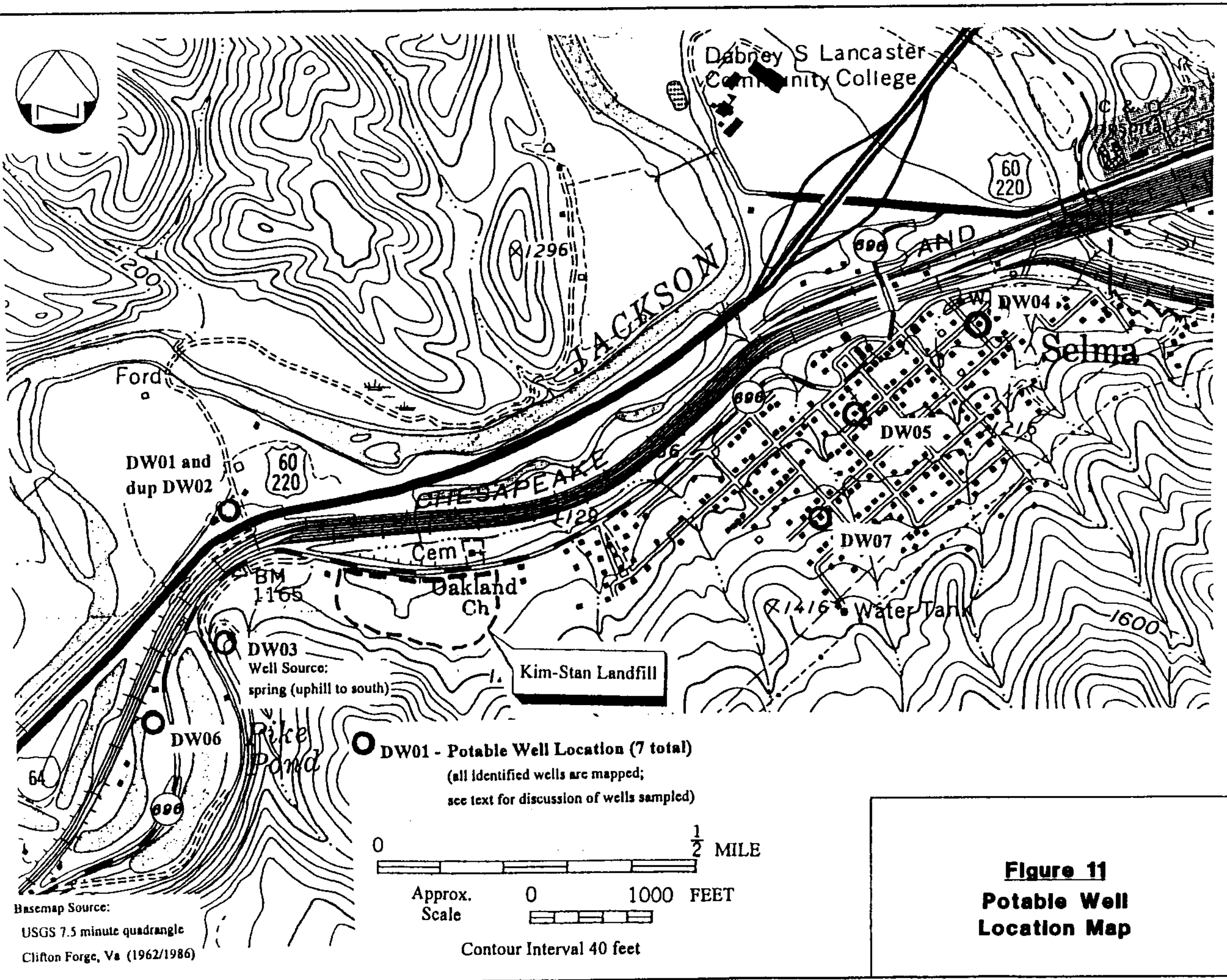


Figure 11
Potable Well Location Map

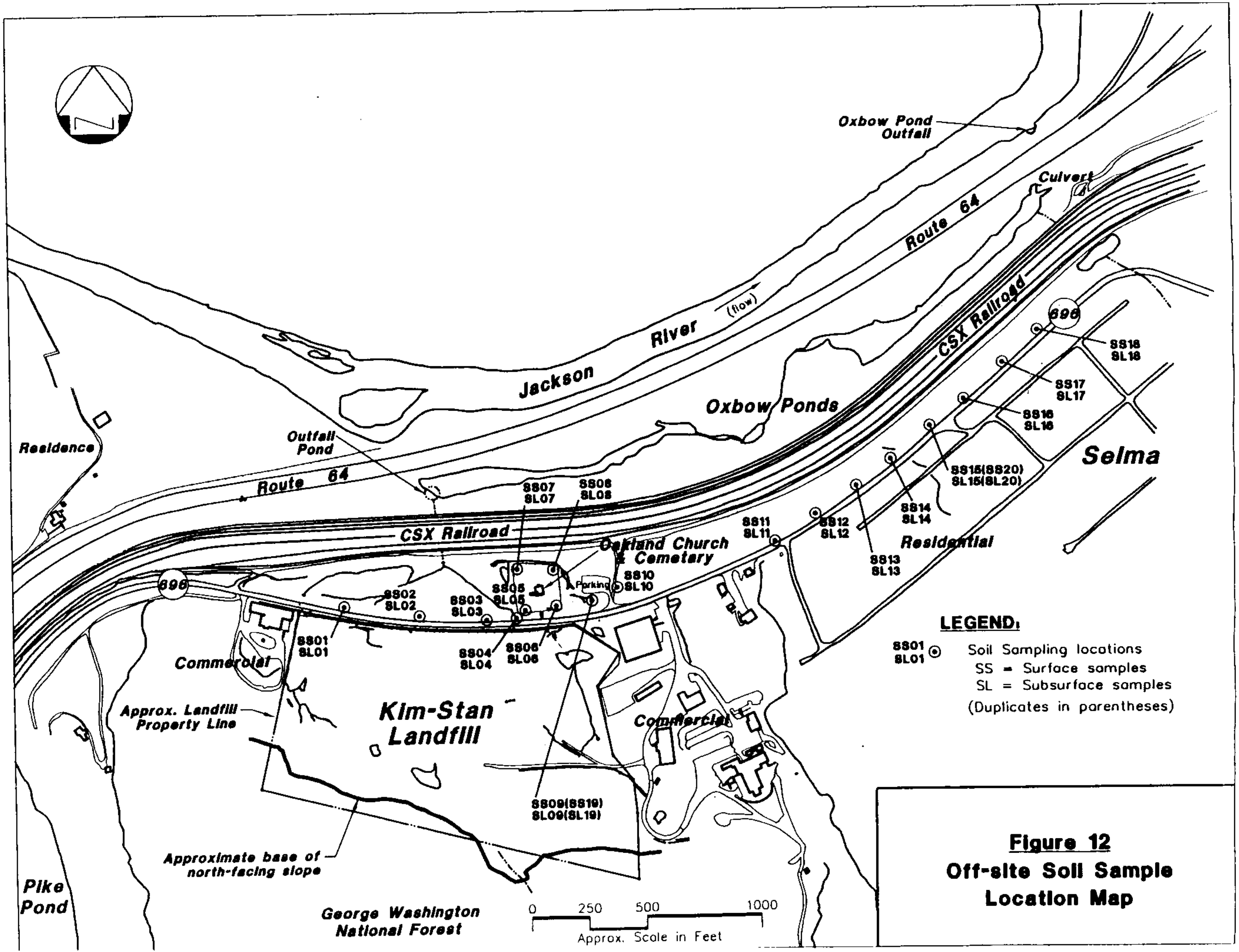


Figure 12
Off-site Soil Sample Location Map

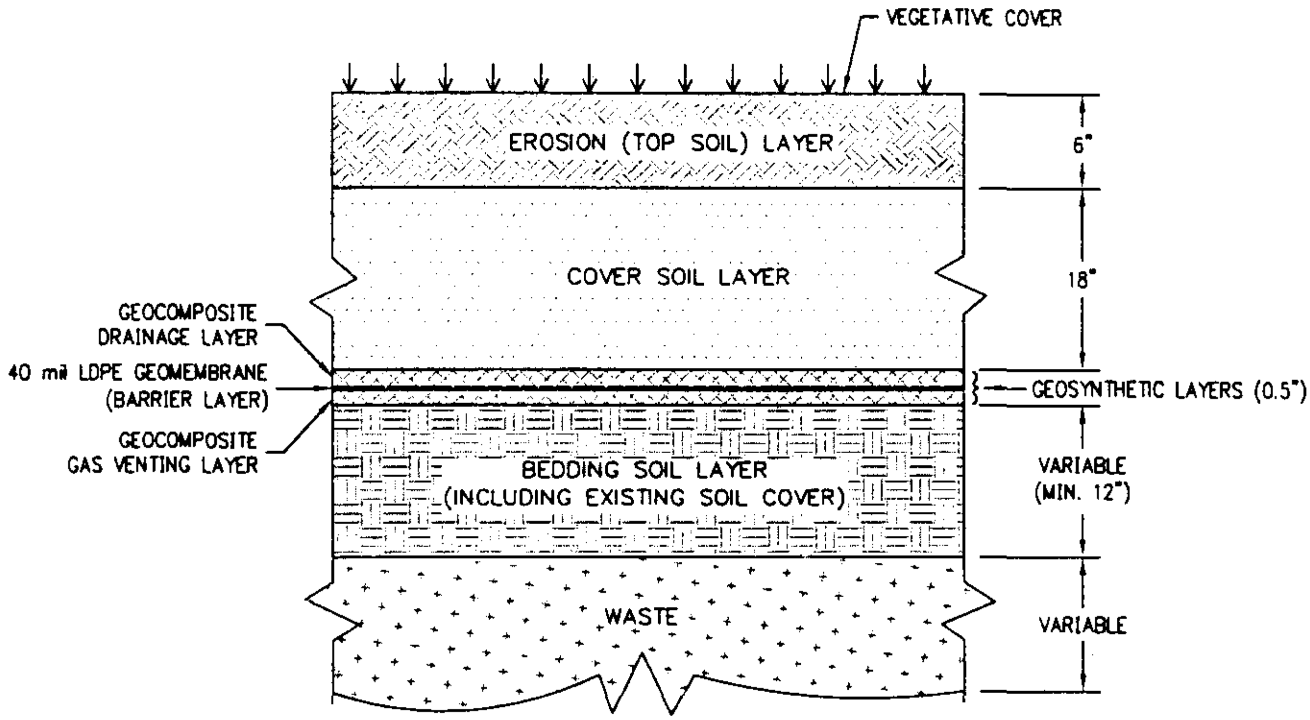


Figure 13

Multi Layer Cap Diagram

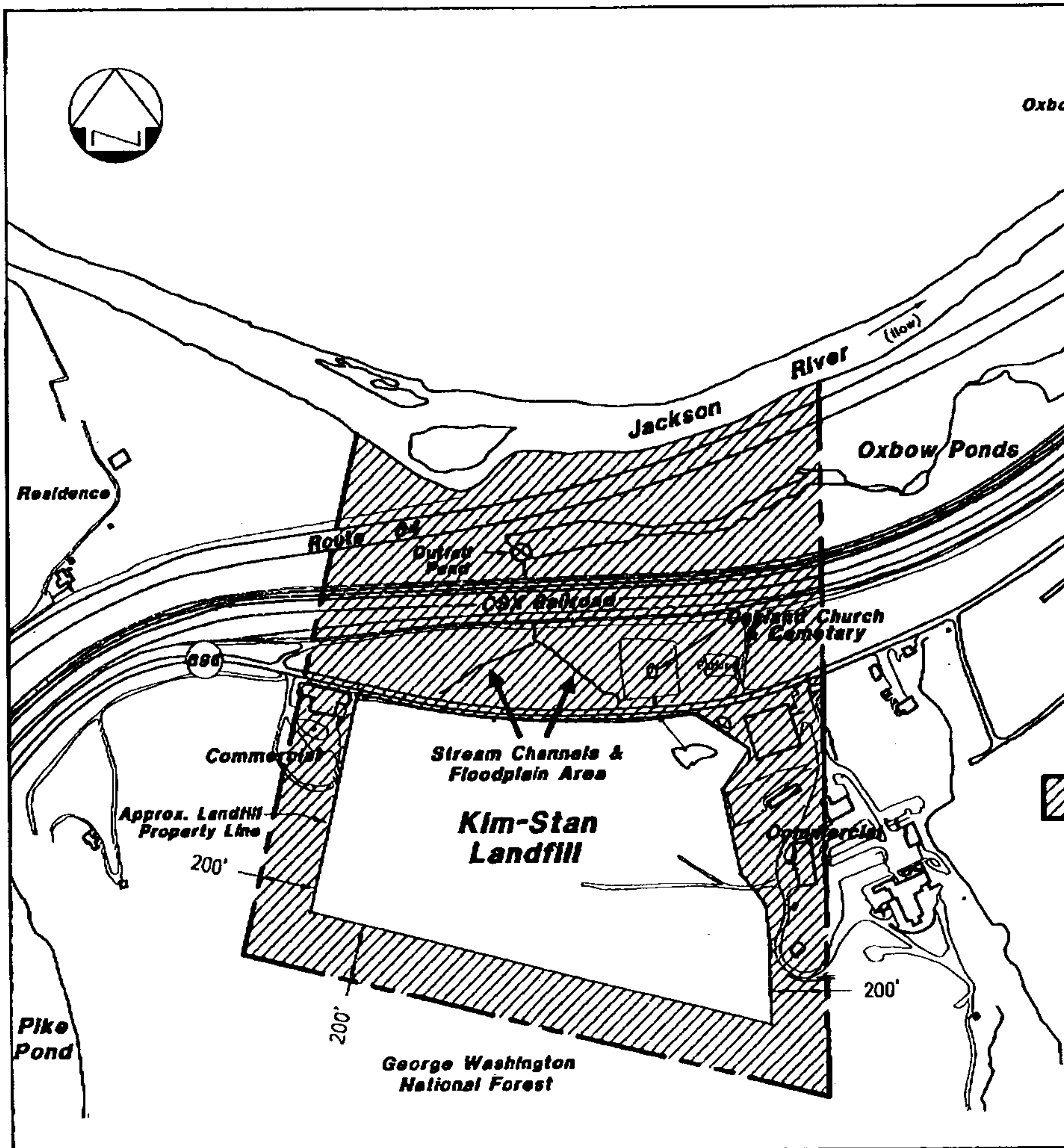
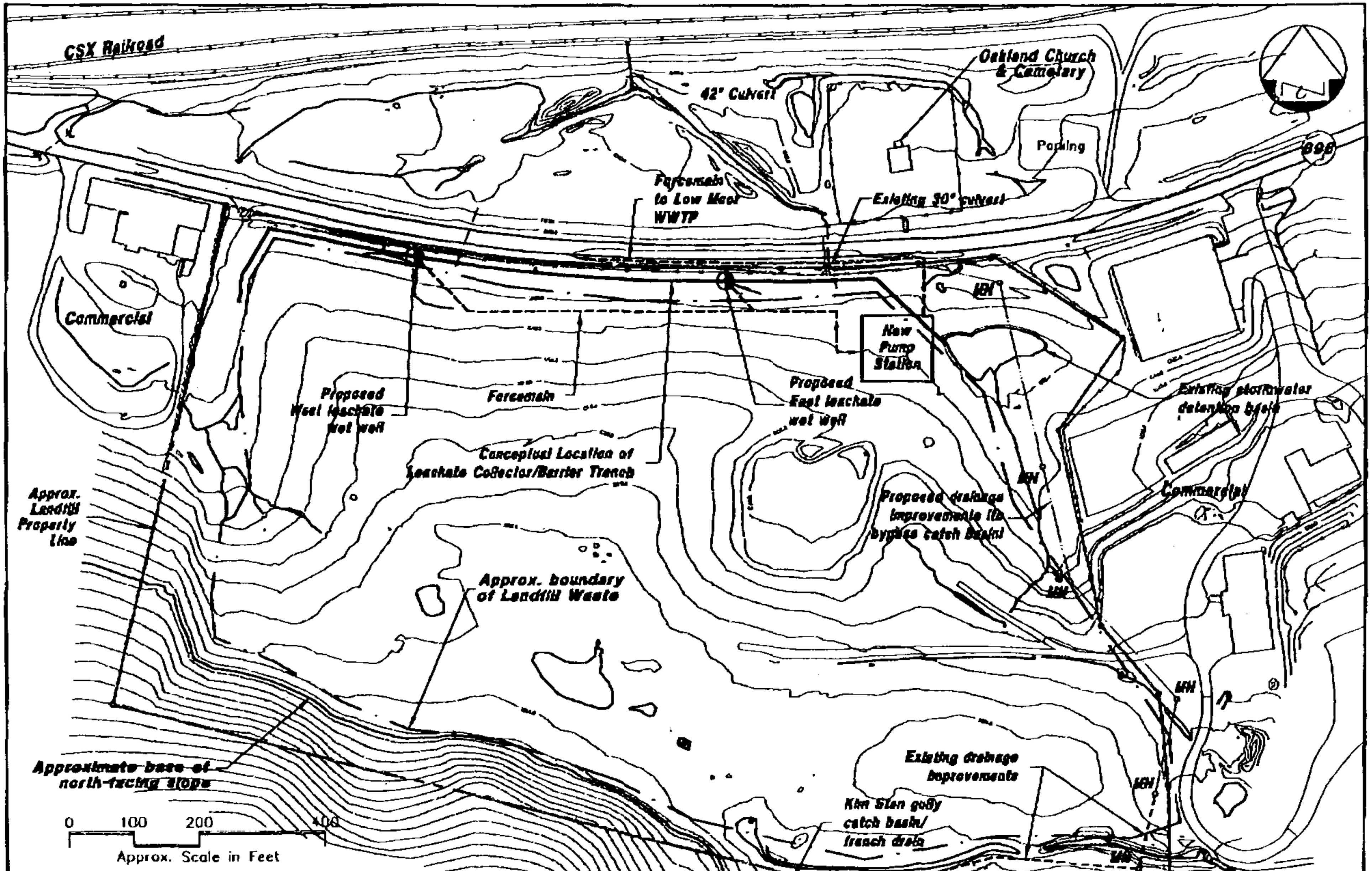


Figure 14
Area of Institutional Controls



Legend:

CONCEPTUAL COLLECTOR/ BARRIER TRENCH

WET WELL LOCATIONS

Figure 15
Pump and Treat Using New Collector Trench - Discharge To WWTP

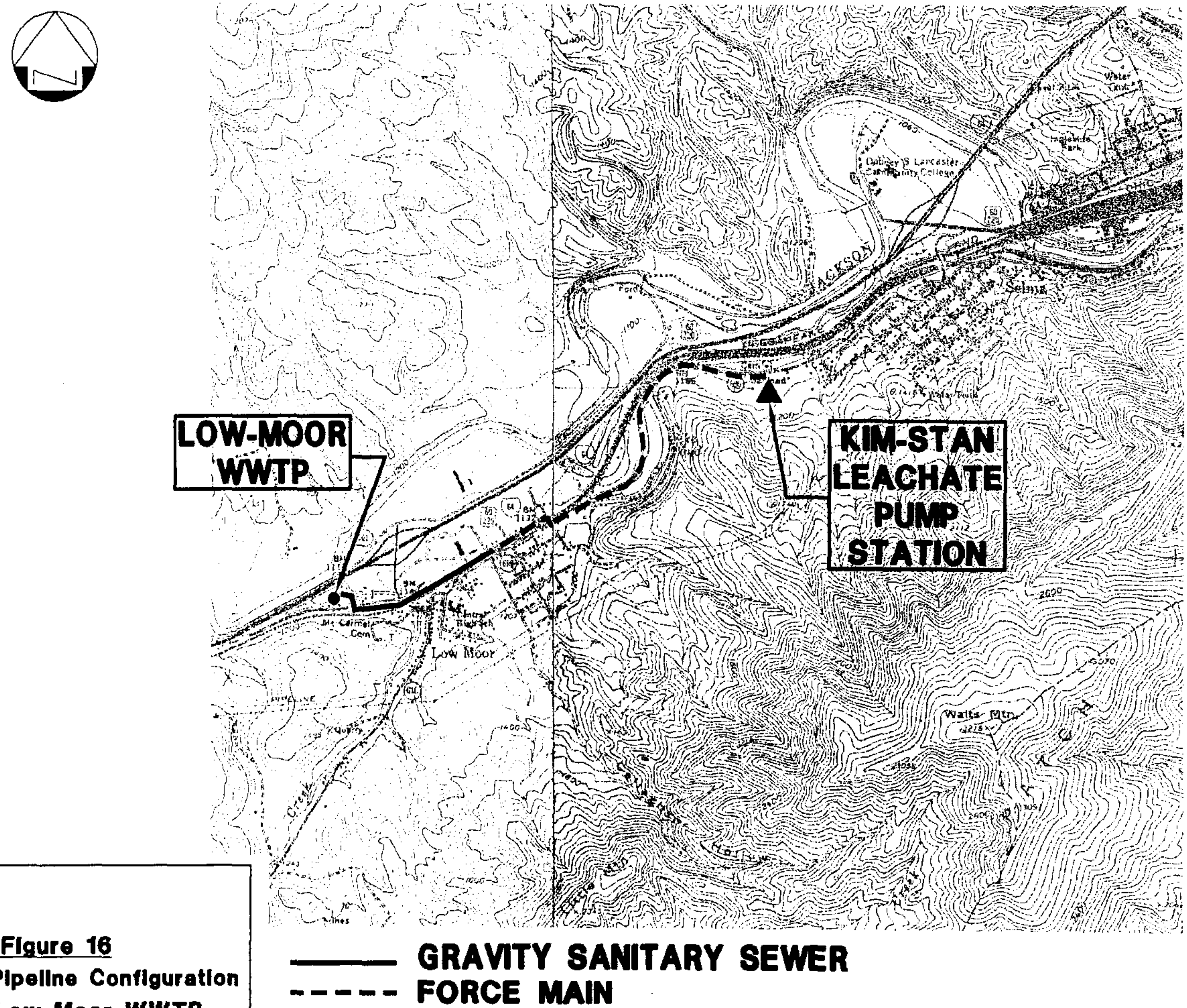


Figure 16
Proposed Pipeline Configuration to the Low Moor WWTP

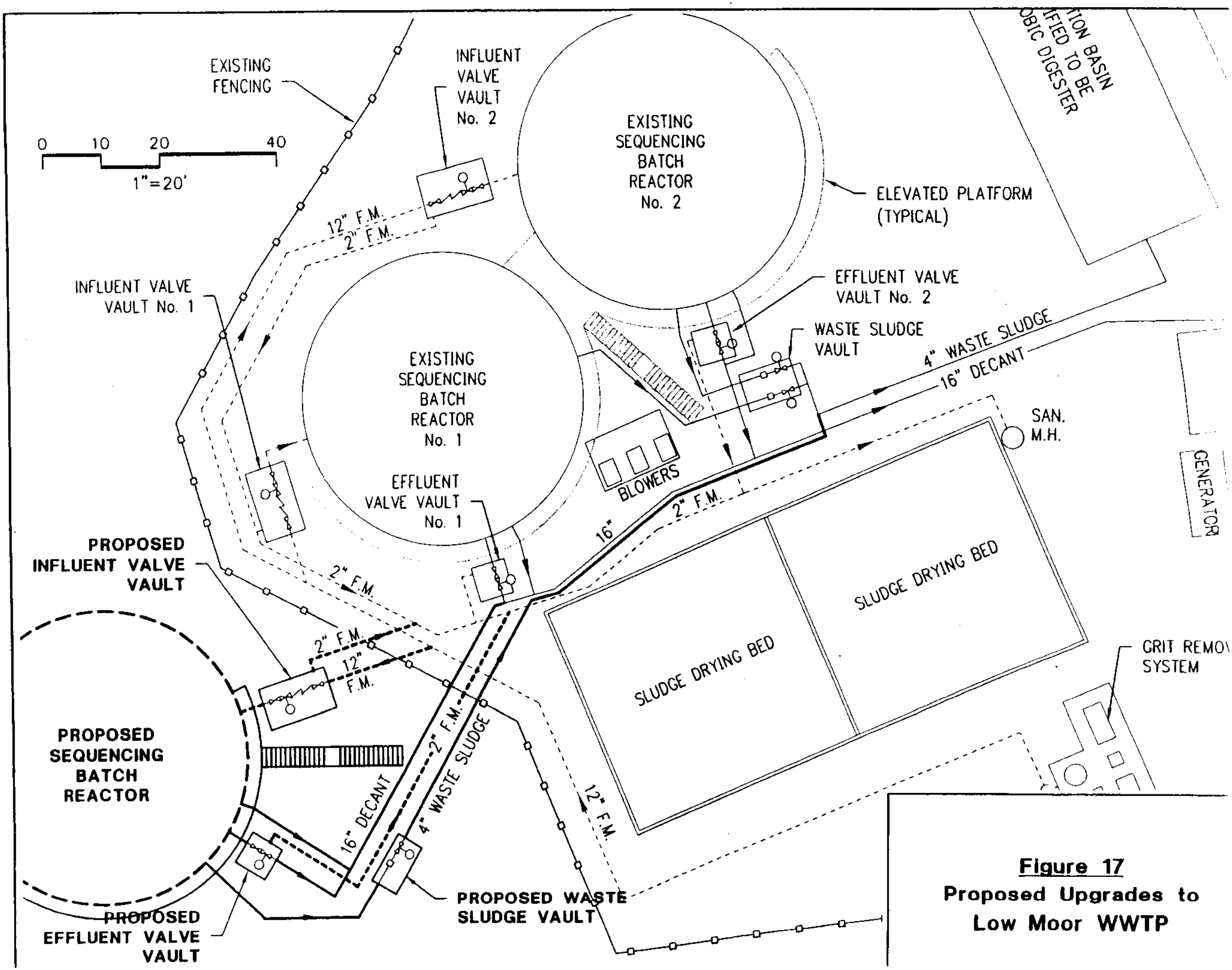


Figure 17
Proposed Upgrades to Low Moor WWTP

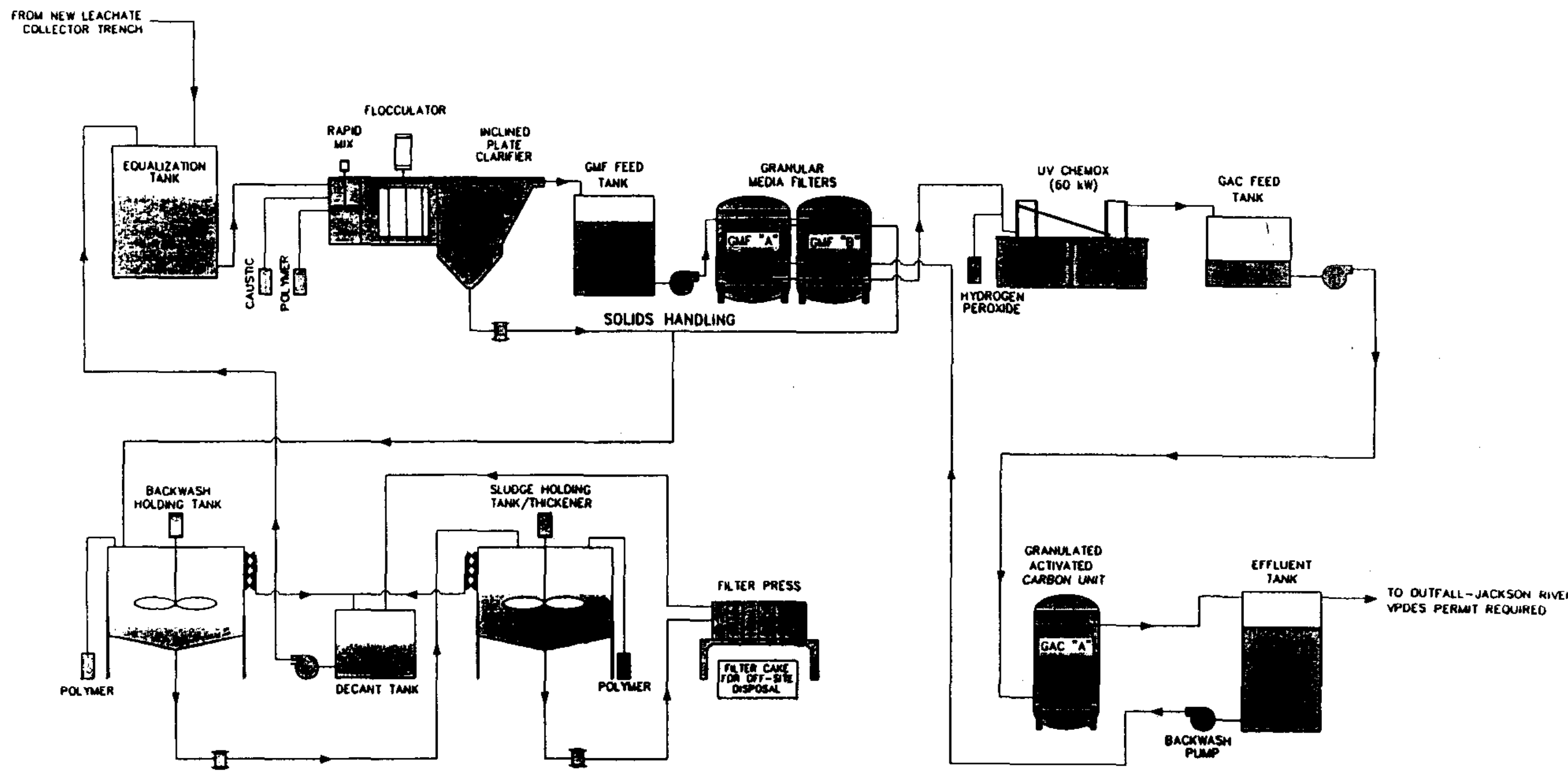
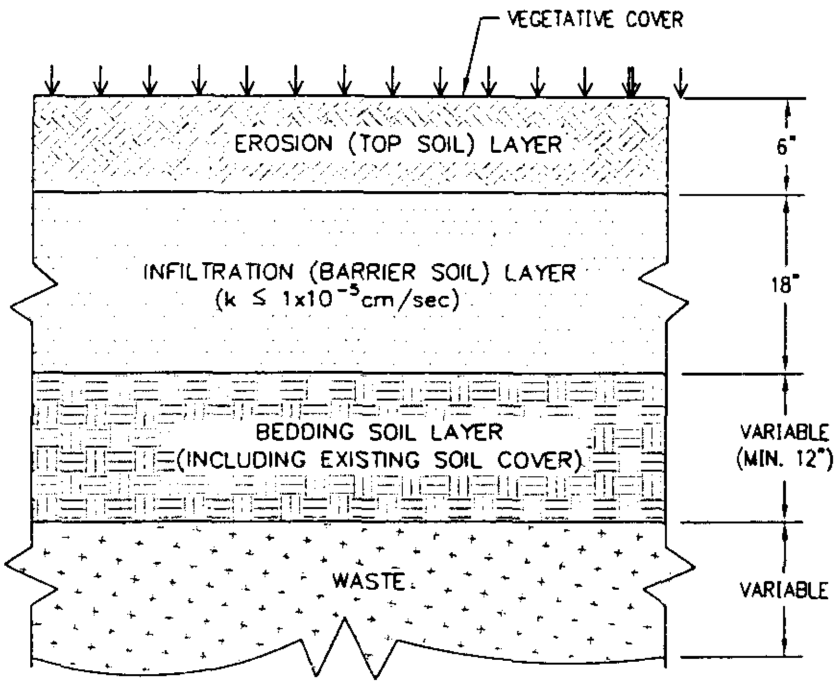


Figure 18

On Site Treatment Process Diagram



CAP-1 (SOIL CAP)

NOT TO SCALE

Figure 19

Soil Cap Diagram

Table 1 (Page 1 of 2)
Summary of Current and Historical Sediment Analytical Results
Frequency and Range Detected

(note: units vary - see analytical subsections of table)

Compound/Analyte	RBC (2)	Current Sediment Data Frequency	Current Sediment Data Range	Historical Sediment Data Frequency	Historical Sediment Data Range	Combined Frequency
Volatile Organic Compounds			ug/Kg		ug/Kg (1)	
Acetone	7,800,000 N	1/31	246 - 246	3/5	5 - 9.6	4/36
2-Butanone	47,000,000 N	1/42	26 - 26	4/15	2 J - 7.2	5/57
Carbon Disulfide	7,800,000 N	1/35	3 J - 3 J	1/15	0.8 J - 0.8 J	2/50
1,1,1-Trichloroethane	22,000,000 N	1/35	4 J - 4 J	No detections reported		1/35
Benzene	120,000 C	1/35	4 J - 4 J	No detections reported		1/35
Toluene	16,000,000 N	1/35	2 J - 2 J	No detections reported		1/35
Tetrachloroethene	120,000 C	2/35	3 J - 8 J	No detections reported		2/35
Chlorobenzene	1,600,000 N	1/35	4 J - 4 J	No detections reported		1/35
Ethylbenzene	7,800,000 N	1/35	4 J - 4 J	No detections reported		1/35
Xylenes (total)	160,000,000 N	1/32	18 - 18	No detections reported		1/35
1,4-Dichlorobenzene	270,000 C	1/35	3 J - 3 J	No detections reported		1/35
Semivolatile Organic Compounds			ug/Kg		ug/Kg (1)	
Acenapthene	4,700,000 N	1/35	41 J - 41 J	1/15	100 J - 100 J	2/50
Acenaphthylene	NTX	9/35	42 J - 400 J	No detections reported		9/35
Anthracene	23,000,000 N	10/44	52 J - 670	1/10	360 - 360	11/54
Benzoic Acid	310,000,000 N	2/9	300 J - 500 J	No detections reported		2/9
Benzo(a)Anthracene	8,700 C	27/44	31 J - 2600	2/15	60 J - 970	29/59
Benzo(a)Pyrene	870 C	28/44	34 J - 2000 J	5/15	30 J - 670	33/59
Benzo(b)Fluoranthene	8,700 C	30/44	35 J - 3900 J	5/15	40 J - 690	35/59
Benzo(g,h,I)Perylene	NTX	23/35	26 J - 1200 J	1/15	370 - 370	24/50
Benzo(k)Fluoranthene	87,000 C	24/44	46 J - 2200 J	5/15	30 J - 590	29/59
1,1'-Biphenyl	3,900,000 N	1/35	39 J - 39 J	No detections reported		1/35
Bis(2-Ethylhexyl)Phthalate	420,000 C	No detections reported		5/15	40 J - 100 J	5/15
Butylbenzylphthalate	16,000,000 N	7/44	79 J - 540 J	No detections reported		7/44
Carbozole	320,000 C	6/35	33 J - 110 J	1/15	80 J - 80 J	7/50
4-Chloro-3-methylphenol	NTX	2/35	30 J - 30 J	No detections reported		1/35
Chrysene	870,000 C	36/44	38 J - 3000	2/15	50 J - 1140	38/59
Dibenzo(a,h)Anthracene	870 C	7/35	45 J - 370 J	1/15	200 J - 200 J	8/50
Dibenzofuran	310,000 N	5/35	38 J - 120 J	1/15	80 J - 80 J	6/50
Di-n-butylphthalate	NTX	4/35	23 J - 410 J	No detections reported		4/35
Di-n-octylphthalate	1,600,000 N	2/35	31 J - 56 J	No detections reported		2/35
Fluoranthene	3,100,000 N	35/44	45 J - 2900	9/15	30 J - 2490	44/59
Fluorene	3,100,000 N	3/35	32 J - 46 J	1/15	100 J - 100 J	4/50
Indeno(1,2,3-cd)Pyrene	8,700 C	23/44	32 J - 1500 J	1/15	340 - 340	24/59
2-Methylnaphthalene	NTX	21/44	29 J - 310 J	2/15	50 J - 200 J	23/59
4-Methylphenol	3,900,000 N	8/35	37 J - 620 J	3/15	30 J - 40 J	11/50
Naphthalene	16,000,000 N	16/44	28 J - 190 J	2/15	40 J - 80 J	18/59
N-Nitrosodiphenylamine	1,300,000 C	10/35	27 J - 400 J	5/15	40 J - 200 J	15/50
Phenanthrene	NTX	36/44	34 J - 490	6/15	40 J - 1240	42/59
Phenol	47,000,000 N	2/35	300 J - 460 J	No detections reported		2/35
Pyrene	2,300,000 N	36/44	43 J - 4900 +	6/15	60 J - 1870	42/59

Table 1 (Page 2 of 2)
Summary of Current and Historical Sediment Analytical Results
Frequency and Range Detected

Compound/Analyte	RBC (2)	Current Sediment Data		Historical Sediment Data		Combined Frequency
		Frequency	Range	Frequency	Range	
Pesticides/PCBs			ug/Kg		ug/Kg (1)	
alpha-BHC	1,000 C	1/35	1.1 J - 1.1 J	No detections reported		1/35
beta-BHC	3,500 C	4/35	0.74 J - 8.8 J	No detections reported		4/35
delta-BHC	NTX	2/43	1.4 J - 2.5 J	No detections reported		2/43
gamma-BHC (lindane)	4,900 C	6/35	2.1 J - 6.9	No detections reported		6/35
Aldrin	380 C	5/7	5.1 - 15.7	No detections reported		5/7
Dieldrin	400 C	5/35	2.4 J - 6.3 J	No detections reported		5/35
4,4'-DDD	27,000 C	1/35	4.6 J - 4.6 J	No detections reported		1/35
4,4'-DDE	19,000 C	4/35	0.95 J - 19	No detections reported		4/35
4,4'-DDT	19,000 C	11/42	4.6 J - 28 J	5/15	19 J - 52 J	16/57
Endosulfan II	NTX	2/44	4.5 J - 6.7	No detections reported		2/44
Endosulfan Sulfate	NTX	7/44	1.9 J - 26 J	No detections reported		7/44
Endrin	23,000 N	1/35	3 J - 3 J	No detections reported		1/35
Methoxychlor	390,000 N	3/35	1.7 J - 7 J	No detections reported		3/35
Endrin Ketone	NTX	2/35	3.9 J - 5 J	No detections reported		2/35
Endrin aldehyde	NTX	4/43	4.5 J - 12 J	No detections reported		4/43
alpha-Chlordane	NTX	1/43	7 J - 7 J	No detections reported		1/43
Inorganic Analytes			mg/Kg		mg/Kg	
Aluminum	78,000 N	44/44	285 - 8940	15/15	3820 - 11400	59/59
Antimony	31 N	No detections reported		8/15	0.3 - 1.7	8/15
Arsenic	4.3 C	32/32	8 - 79.8	15/15	3.6 - 23.7	47/47
Barium	5,500 N	44/44	121 - 3380	15/15	99 - 922	59/59
Beryllium	160 N	43/44	0.15 [ ] - 3.7	15/15	0.6 - 2.6	58/59
Cadmium	39 N	25/44	0.26 [ ] - 9.5	13/15	0.5 - 4.0	38/59
Calcium	NTX	44/44	1600 - 73100	15/15	1620 - 49000	59/59
Chromium	120,000 N	43/44	7 K - 25.5	15/15	9.2 - 24.4	58/59
Cobalt	4,700 N	44/44	4.5 [ ] - 36.5	15/15	7.6 - 28.1	59/59
Copper	3,100 N	44/44	7.2 - 141	15/15	19.2 - 86.4	59/59
Cyanide	1,600 N	5/44	0.24 [ ] L - 1.3	No detections reported		5/44
Iron	23,000 N	44/44	10100 - 284000	15/15	20700 - 57300	59/59
Lead	400 (action level)	43/44	5.8 - 186	15/15	19.4 - 79.8	58/59
Magnesium	NTX	44/44	363 [ ] - 2040 [ ]	15/15	466 - 2540	59/59
Manganese	1,600 N	44/44	128 - 1860	15/15	199 - 2910	59/59
Mercury	23 N	14/28	0.09 [ ] L - 0.37	4/15	0.1 - 0.4	18/43
Nickel	1,600 N	43/44	6 - 133	15/15	12.1 - 76.7	58/59
Potassium	NTX	44/44	390 [ ] J - 1370 [ ] J	15/15	523 - 1950	59/59
Selenium	390 N	20/44	0.9 - 7.1	13/15	0.4 - 3.5	33/59
Silver	390 N	16/44	0.59 [ ] - 3.1 [ ]	1/15	2.0 < - 2.0 <	17/59
Sodium	NTX	37/44	99.4 [ ] J - 1810	12/15	101 - 451	49/59
Thallium	5.5 N	2/44	3.6 [ ] K - 4.2 K	10/15	0.3 - 1.4	12/59
Vanadium	550 N	43/44	11.1 [ ] - 56.6	15/15	16.4 - 46.8	58/59
Zinc	23,000 N	44/44	56 - 1080	15/15	103 - 381	59/59

= Contaminants of potential concern (based on human risk assessment selection criteria).

Note: Letter and symbol codes are defined in the organic and inorganic data qualifier code glossaries (see report appendices).

1/35 = Number of detections/Number of usable results

no detections reported = in most cases this indicates analyte was not detected; may also indicate analyte was not analyzed, or that detections were not considered usable data (i.e., blank qualified, etc.)

(1) = Units converted from mg/kg (as reported by Weston) for ease of comparison on this table.

(2) = USEPA Region III Risk-Based Concentration for Residential soil, RBC Table dated 10/05/00.

NTX =No Toxicity Information

Table 2 (Page 1 of 7)
Summary of Organic Compound Detections
Sediment Samples
(ug/Kg)

Case:			28200	28200	28200	28200	28200	28200	28200
Sample Number :			C00Z6	C00ZJ	C00ZK	C00ZN	C00Z3	C00Z4	C01HZ
Sampling Location :			KSL-SD01-03-600	KSL-SD02-03-600	KSL-SD03-03-600	KSL-SD04-03-600	KSL-SD05-03-600	KSL-SD06-03-600	KSL-SD27-03-600
Field QC:								Dup. Collected	Dup. (C00Z4)
Matrix :			Soil	Soil	Soil	Soil	Soil	Soil	Soil
Units :			ug/Kg	ug/Kg	ug/Kg	ug/Kg	ug/Kg	ug/Kg	ug/Kg
Date Sampled :			06/22/2000	06/22/2000	06/22/2000	06/22/2000	06/22/2000	06/22/2000	06/22/2000
Time Sampled :			08:35	19:15	19:35	17:40	17:15	18:30	18:05
%Moisture :			42	50	40	39	40	60	55
pH :									
Dilution Factor :			1.0	1.0	1.0	1.0	1.0	1.0	1.0
Compound	CRQL	RBC	Result Flag	Result Flag	Result Flag	Result Flag	Result Flag	Result Flag	Result Flag
Volatile Organic Compounds									
Acetone	10	7,800,000 N							
Carbon Disulfide	10	7,800,000 N							
Methylene Chloride	10	850,000 C	2 B	8 B	6 B	6 B			37 B
2-Butanone	10	47,000,000 N							
1,1,1-Trichloroethane	10	22,000,000 N							
Carbon Tetrachloride	10	49,000 C							
Benzene	10	120,000 C							
Toluene	10	16,000,000 N							
Tetrachloroethene	10	120,000 C			8 J				
Chlorobenzene	10	1,600,000 N							4 J
Ethylbenzene	10	7,800,000 N							
Xylenes (total)	10	160,000,000 N		5 B					
1,4-Dichlorobenzene	10	270,000 C							3 J
Semivolatile Organic Compounds									
Benzaldehyde	330	7,800,000 N		140 B	74 B	120 B	64 B	100 B	
Phenol	330	47,000,000 N							
Acetophenone	330	7,800,000 N	45 B			27 B	160 B	82 B	81 B
4-Methylphenol	330	3,900,000 N		100 J		160 J			
Naphthalene	330	16,000,000 N				60 J	28 J		
Caprolactam	330	39,000,000 N							
4-Chloro-3-methylphenol	330	NTX							
2-Methylnaphthalene	330	NTX				78 J	47 J		
1,1'-Biphenyl	330	3,900,000 N							
Acenaphthylene	330	NTX				160 J	94 J		
Acenaphthene	330	4,700,000 N							
Dibenzofuran	330	310,000 N				53 J			
Fluorene	330	3,100,000 N				38 J			
N-Nitrosodiphenylamine	330	1,300,000 C						41 J	86 J
Phenanthrene	330	NTX		50 J	39 J	480 J	140 J		
Anthracene	330	23,000,000 N				230 J	72 J		
Carbazole	330	320,000 C				47 J			
Di-n-butylphthalate	330	NTX			410 J	30 J			
Fluoranthene	330	3,100,000 N		51 J	45 J	1,300	510 J		
Pyrene	330	2,300,000 N		70 J	77 J	1,700 J	470 J		
Butylbenzylphthalate	330	16,000,000 N			110 J	UJ	79 J		
Benzo(a)anthracene	330	8,700 C			31 J	940 J	290 J		
Chrysene	330	870,000 C		47 J	38 J	1,100 J	370 J		
bis(2-Ethylhexyl)phthalate	330	420,000 C	360 B	460 B	1,000 B	330 B	340 B	510 B	160 B
Di-n-octylphthalate	330	1,600,000 N		UJ	31 J	UJ			
Benzo(b)fluoranthene	330	8,700 C		39 J	35 J	1,100 J	490 J		
Benzo(k)fluoranthene	330	87,000 C		UJ	UJ	960 J	340 J		
Benzo(a)pyrene	330	870 C		34 J	UJ	800 J	260 J		
Indeno(1,2,3-cd)pyrene	330	8,700 C		UJ	UJ	600 J	210 J		
Dibenzo(a,h)anthracene	330	870 C		UJ	UJ	160 J	45 J		
Benzo(g,h,i)perylene	330	NTX		UJ	UJ	480 J	170 J		
Benzoic Acid	1670	310,000,000 N							
Pesticides/PCBs									
Aldrin	2	380 C							
alpha-BHC	1.7	1,000 C							
beta-BHC	1.7	3,500 C							
delta-BHC	1.7	NTX							
gamma-BHC (Lindane)	1.7	4,900 C							2.1 J
Heptachlor	1.7	1,400 C		2.9 B	2.5 B	3.5 B	2.6 B	3.3 B	5.4 B
Heptachlor Epoxide	2	700C							
Dieldrin	3.3	400 C							3.5 J
4,4'-DDE	3.3	19,000 C							
Endrin	3.3	23,000 N							
Endosulfan I	2	NTX							
Endosulfan II	3.3	NTX			4.5 J				
4,4'-DDD	3.3	27,000 C							
Endosulfan sulfate	3.3	NTX				4.4 J			
4,4'-DDT	3.3	19,000 C				6.9	4.6 J		10 J
Methoxychlor	17	390,000 N		3.4 J					
Endrin ketone	3.3	NTX				5.0 J			
Endrin aldehyde	3.3	NTX							
alpha-Chlordane	1.7	NTX							
gamma-Chlordane	1.7	NTX							4.6 B

Notes:
CRQL = Contract Required Quantitation Limit
Flag = see Qualifier Code Glossaries
sample quantitation limits = CRQL X Dilution Factor
NTX = No Toxicity Information
RBC = USEPA Region III Risk-Based Concentration for Residential soil,
RBC table dated 10/05/00

Table 2 (Page 2 of 7)
Summary of Organic Compound Detections
Sediment Samples
(ug/Kg)

Case:			28200	28200	28200	28200	28200	28200	28200
Sample Number:			C00Z5	C01GX	C01GY	C01GZ	C01H0	C01H1	C01H2
Sampling Location:			KSL-SD07-03-600	KSL-SD08-03-600	KSL-SD09-03-600	KSL-SD10-03-600	KSL-SD11-03-600	KSL-SD12-03-600	KSL-SD13-03-600
Field QC:									
Matrix:			Soil	Soil	Soil	Soil	Soil	Soil	Soil
Units:			ug/Kg	ug/Kg	ug/Kg	ug/Kg	ug/Kg	ug/Kg	ug/Kg
Date Sampled:			06/22/2000	06/22/2000	06/22/2000	06/22/2000	06/22/2000	06/22/2000	06/23/2000
Time Sampled:			16:45	14:50	14:25	13:58	15:15	15:30	10:44
%Moisture:			69	24	49	28	49	39	30
pH:									
Dilution Factor:			1.0	1.0	1.0	1.0	1.0	1.0	1.0
Compound	**CRQL**	**RBC**	**Result Flag**	**Result Flag**	**Result Flag**	**Result Flag**	**Result Flag**	**Result Flag**	**Result Flag**
Volatile Organic Compounds									
Acetone	10	7,800,000 N						52 B	
Carbon Disulfide	10	7,800,000 N							
Methylene Chloride	10	850,000 C	23 B	7 B	38 B		8 B	9 B	6 B
2-Butanone	10	47,000,000 N							
1,1,1-Trichloroethane	10	22,000,000 N							
Carbon Tetrachloride	10	49,000 C							
Benzene	10	120,000 C							
Toluene	10	16,000,000 N						2 J	
Tetrachloroethene	10	120,000 C							
Chlorobenzene	10	1,600,000 N							
Ethylbenzene	10	7,800,000 N							4 J
Xylenes (total)	10	160,000,000 N							18
1,4-Dichlorobenzene	10	270,000 C							
Semivolatile Organic Compounds									
Benzaldehyde	330	7,800,000 N	150 B		59 B			190 B	
Phenol	330	47,000,000 N			300 J				
Acetophenone	330	7,800,000 N	140 B	53 B	86 B	71 B	65 B	78 B	36 B
4-Methylphenol	330	3,900,000 N			620 J			340 J	
Naphthalene	330	16,000,000 N						42 J	
Caprolactam	330	39,000,000 N							
4-Chloro-3-methylphenol	330	NTX		30 J					
2-Methylnaphthalene	330	NTX					34 J	62 J	
1,1'-Biphenyl	330	3,900,000 N							
Acenaphthylene	330	NTX	94 J						
Acenaphthene	330	4,700,000 N							
Dibenzofuran	330	310,000 N							
Fluorene	330	3,100,000 N							
N-Nitrosodiphenylamine	330	1,300,000 C	140 J			27 J			48 J
Phenanthrene	330	NTX	120 J		34 J	40 J	83 J	110 J	46 J
Anthracene	330	23,000,000 N	79 J						
Carbazole	330	320,000 C							
Di-n-butylphthalate	330	NTX				23 J			
Fluoranthene	330	3,100,000 N	430 J		45 J	110 J	110 J	150 J	69 J
Pyrene	330	2,300,000 N	490 J		44 J	84 J		180 J	100 J
Butylbenzylphthalate	330	16,000,000 N							
Benzo(a)anthracene	330	8,700 C	260 J			55 J	57 J	88 J	50 J
Chrysene	330	870,000 C	340 J		44 J	76 J	91 J	120 J	64 J
bis(2-Ethylhexyl)phthalate	330	420,000 C	820 B	100 B	87 B	92 B	230 B	68 B	170 B
Di-n-octylphthalate	330	1,600,000 N					UJ	UJ	UJ
Benzo(b)fluoranthene	330	8,700 C	400 J			66 J	93 J	120 J	75 J
Benzo(k)fluoranthene	330	87,000 C	380 J			60 J	68 J	87 J	49 J
Benzo(a)pyrene	330	870 C	250 J			52 J	76 J	80 J	43 J
Indeno(1,2,3-cd)pyrene	330	8,700 C	230 J			32 J	37 J	43 J	UJ
Dibenzo(a,h)anthracene	330	870 C					UJ	UJ	UJ
Benzo(g,h,i)perylene	330	NTX	190 J			27 J	34 J	42 J	26 J
Benzoic Acid	1670	310,000,000 N							
Pesticides/PCBs									
Aldrin	2	380 C							
alpha-BHC	1.7	1,000 C							
beta-BHC	1.7	3,500 C							
delta-BHC	1.7	NTX						1.4 J	
gamma-BHC (Lindane)	1.7	4,900 C							
Heptachlor	1.7	1,400 C	5.1 B	1.7 B	3.9 B	2.7 B	3.8 B	3.4 B	2.2 B
Heptachlor Epoxide	2	700C							
Dieldrin	3.3	400 C							
4,4'-DDE	3.3	19,000 C						0.95 J	
Endrin	3.3	23,000 N							
Endosulfan I	2	NTX							
Endosulfan II	3.3	NTX							
4,4'-DDD	3.3	27,000 C							
Endosulfan sulfate	3.3	NTX							
4,4'-DDT	3.3	19,000 C			6.0 J				
Methoxychlor	17	390,000 N							
Endrin ketone	3.3	NTX							
Endrin aldehyde	3.3	NTX							
alpha-Chlordane	1.7	NTX							
gamma-Chlordane	1.7	NTX			2.5 B	0.89 B	1.3 B		

Notes:
CRQL = Contract Required Quantitation Limit
Flag = see Qualifier Code Glossaries
sample quantitation limits = CRQL X Dilution Factor
NTX = No Toxicity Information
RBC = USEPA Region III Risk-Based Concentration for Residential soil,
RBC table dated 10/05/00.

Table 2 (Page 3 of 7)
Summary of Organic Compound Detections
Sediment Samples
(ug/Kg)

Case:			28200	28200	28200	28200	28200	28200	28200
Sample Number :			C01H4	C01H3	C01H5	C00ZP	C00ZQ	C00ZT	C01HT
Sampling Location :			KSL-SD13-12-600	KSL-SD14-03-600	KSL-SD14-12-600	KSL-SD15-03-600	KSL-SD15-12-600	KSL-SD16-03-600	KSL-SD29-03-600
Field QC:								Dup. Collected	Dup. (C00ZT)
Matrix :			Soil	Soil	Soil	Soil	Soil	Soil	Soil
Units :			ug/Kg	ug/Kg	ug/Kg	ug/Kg	ug/Kg	ug/Kg	ug/Kg
Date Sampled :			06/23/2000	06/23/2000	06/23/2000	06/23/2000	06/23/2000	06/23/2000	06/23/2000
Time Sampled :			10:53	09:58	10:12	09:25	09:37	08:25	08:00
%Moisture :			47	58	40	50	45	59	50
pH :									
Dilution Factor :			1.0	1.0	1.0	1.0	1.0	1.0	1.0
Compound	CRQL	RBC	Result Flag	Result Flag	Result Flag	Result Flag	Result Flag	Result Flag	Result Flag
Volatile Organic Compounds									
Acetone	10	7,800,000 N	31 B		110 B				
Carbon Disulfide	10	7,800,000 N			3 J				
Methylene Chloride	10	850,000 C	9 B	7 B	10 B		5 B	6 B	36 B
2-Butanone	10	47,000,000 N			26				
1,1,1-Trichloroethane	10	22,000,000 N							
Carbon Tetrachloride	10	49,000 C							
Benzene	10	120,000 C			4 J				
Toluene	10	16,000,000 N							
Tetrachloroethene	10	120,000 C							
Chlorobenzene	10	1,600,000 N							
Ethylbenzene	10	7,800,000 N							
Xylenes (total)	10	160,000,000 N			2 B				
1,4-Dichlorobenzene	10	270,000 C							
Semivolatile Organic Compounds									
Benzaldehyde	330	7,800,000 N	160 B			140 B	120 B	160 B	82 B
Phenol	330	47,000,000 N							
Acetophenone	330	7,800,000 N		88 B	30 B			46 B	49 B
4-Methylphenol	330	3,900,000 N							
Naphthalene	330	16,000,000 N	52 J						
Caprolactam	330	39,000,000 N						100 B	
4-Chloro-3-methylphenol	330	NTX							
2-Methylnaphthalene	330	NTX	58 J		29 J	35 J	34 J		
1,1'-Biphenyl	330	3,900,000 N							
Acenaphthylene	330	NTX		42 J					
Acenaphthene	330	4,700,000 N							
Dibenzofuran	330	310,000 N							
Fluorene	330	3,100,000 N							
N-Nitrosodiphenylamine	330	1,300,000 C	100 J	160 J		37 J		48 J	
Phenanthrene	330	NTX	280 J	86 J	37 J	59 J	150 J	120 J	56 J
Anthracene	330	23,000,000 N	52 J						
Carbazole	330	320,000 C	33 J						
Di-n-butylphthalate	330	NTX						41 J	
Fluoranthene	330	3,100,000 N	320 J	250 J		91 J	150 J	150 J	73 J
Pyrene	330	2,300,000 N	370 J	340 J	43 J	110 J	230 J	180 J	160 J
Butylbenzylphthalate	330	16,000,000 N						UJ	UJ
Benzo(a)anthracene	330	8,700 C	160 J	240 J		55 J	100 J	90 J	56 J
Chrysene	330	870,000 C	180 J	330 J		78 J	110 J	110 J	77 J
bis(2-Ethylhexyl)phthalate	330	420,000 C	190 B	260 B	360 B	400 B	280 B	400 B	310 B
Di-n-octylphthalate	330	1,600,000 N	UJ	UJ	UJ	UJ		UJ	UJ
Benzo(b)fluoranthene	330	8,700 C	310 J	300 J	UJ	86 J	110 J	110 J	150 J
Benzo(k)fluoranthene	330	87,000 C	UJ	290 J	UJ	56 J	110 J	100 J	UJ
Benzo(a)pyrene	330	870 C	150 J	210 J	UJ	65 J	84 J	94 J	54 J
Indeno(1,2,3-cd)pyrene	330	8,700 C	77 J	140 J	UJ	50 J	58 J	87 J	47 J
Dibenzo(a,h)anthracene	330	870 C	UJ	UJ	UJ	UJ		UJ	UJ
Benzo(g,h,i)perylene	330	NTX	66 J	100 J	UJ	55 J	55 J	82 J	56 J
Benzoic Acid	1670	310,000,000 N							
Pesticides/PCBs									
Aldrin	2	380 C							
alpha-BHC	1.7	1,000 C							
beta-BHC	1.7	3,500 C	3.6 J				8.8 J		
delta-BHC	1.7	NTX	2.5 J						
gamma-BHC (Lindane)	1.7	4,900 C	5.1				6.0	4.6	
Heptachlor	1.7	1,400 C	2.0 B	3.9 B	1.3 B	4.3 B	4.0 B	3.3 B	3.0 B
Heptachlor Epoxide	2	700C							
Dieldrin	3.3	400 C	2.9 J						
4,4'-DDE	3.3	19,000 C							
Endrin	3.3	23,000 N							
Endosulfan I	2	NTX							
Endosulfan II	3.3	NTX							
4,4'-DDD	3.3	27,000 C							
Endosulfan sulfate	3.3	NTX							
4,4'-DDT	3.3	19,000 C				5.0 J			
Methoxychlor	17	390,000 N					1.7 J		
Endrin ketone	3.3	NTX							
Endrin aldehyde	3.3	NTX					4.5 J		
alpha-Chlordane	1.7	NTX							
gamma-Chlordane	1.7	NTX					1.9 B	2.0 B	

Notes:
CRQL = Contract Required Quantitation Limit
Flag = see Qualifier Code Glossaries
sample quantitation limits = CRQL X Dilution Factor
NTX = No Toxicity Information
RBC = USEPA Region III Risk-Based Concentration for Residential soil,
RBC table dated 10/05/00.

Table 2 (Page 4 of 7)
Summary of Organic Compound Detections
Sediment Samples
(ug/Kg)

Case:			28200	28200	28200	28200	28200	28200	28200
Sample Number :			C00ZW	C00ZF	C00ZG	C00ZX	C00ZY	C00ZZ	C0100
Sampling Location :			KSL-SD16-12-600	KSL-SD17-03-600	KSL-SD18-03-600	KSL-SD19-03-600	KSL-SD19-12-600	KSL-SD20-03-600	KSL-SD20-12-600
Field QC:									
Matrix :			Soil	Soil	Soil	Soil	Soil	Soil	Soil
Units :			ug/Kg	ug/Kg	ug/Kg	ug/Kg	ug/Kg	ug/Kg	ug/Kg
Date Sampled :			06/23/2000	06/22/2000	06/22/2000	06/23/2000	06/23/2000	06/23/2000	06/23/2000
Time Sampled :			08:45	12:05	11:30	15:15	15:22	14:39	14:42
%Moisture :			53	53	60	52	48	41	45
pH :									
Dilution Factor :			1.0	1.0	1.0	1.0	1.0	1.0	1.0
Compound	CRQL	RBC	Result Flag	Result Flag	Result Flag	Result Flag	Result Flag	Result Flag	Result Flag
Volatile Organic Compounds									
Acetone	10	7,800,000 N			41 B				
Carbon Disulfide	10	7,800,000 N							
Methylene Chloride	10	850,000 C	8 B	10 B	13 B		8 B	5 B	2 B
2-Butanone	10	47,000,000 N							
1,1,1-Trichloroethane	10	22,000,000 N			UJ				
Carbon Tetrachloride	10	49,000 C			UJ				
Benzene	10	120,000 C			UJ				
Toluene	10	16,000,000 N		UJ	UJ			UJ	
Tetrachloroethene	10	120,000 C		UJ	UJ			UJ	
Chlorobenzene	10	1,600,000 N		UJ	UJ			UJ	
Ethylbenzene	10	7,800,000 N		UJ	UJ			UJ	
Xylenes (total)	10	160,000,000 N		6 B	UJ			UJ	
1,4-Dichlorobenzene	10	270,000 C		UJ	UJ			UJ	
Semivolatile Organic Compounds									
Benzaldehyde	330	7,800,000 N	220 B	200 B	370 B	63 B	66 B		120 B
Phenol	330	47,000,000 N			460 J				
Acetophenone	330	7,800,000 N					38 B	84 B	120 B
4-Methylphenol	330	3,900,000 N			450 J				
Naphthalene	330	16,000,000 N					63 J	28 J	33 J
Caprolactam	330	39,000,000 N				67 B			56 B
4-Chloro-3-methylphenol	330	NTX							
2-Methylnaphthalene	330	NTX				41 J	85 J	42 J	31 J
1,1'-Biphenyl	330	3,900,000 N							
Acenaphthylene	330	NTX				380 J	240 J		
Acenaphthene	330	4,700,000 N							
Dibenzofuran	330	310,000 N					38 J		
Fluorene	330	3,100,000 N	46 J						
N-Nitrosodiphenylamine	330	1,300,000 C	400 J						
Phenanthrene	330	NTX	130 J	68 J		220 J	330 J	80 J	90 J
Anthracene	330	23,000,000 N				300 J	190 J		
Carbazole	330	320,000 C	65 J			36 J			
Di-n-butylphthalate	330	NTX							
Fluoranthene	330	3,100,000 N	91 J	160 J	73 J	1,700	1,700	140 J	120 J
Pyrene	330	2,300,000 N	82 J	210 J	110 J	2,800	2,800	110 J	190 J
Butylbenzylphthalate	330	16,000,000 N	UJ						
Benzo(a)anthracene	330	8,700 C	UJ	120 J	51 J	1,900	1,700	78 J	88 J
Chrysene	330	870,000 C	44 J	140 J	61 J	1,800	1,500	99 J	120 J
bis(2-Ethylhexyl)phthalate	330	420,000 C	620 B	410 B	520 B	320 B	360 B	46 B	84 B
Di-n-octylphthalate	330	1,600,000 N	UJ	UJ	UJ	UJ			
Benzo(b)fluoranthene	330	8,700 C	50 J	160 J	77 J	2,500 J	1,700	88 J	95 J
Benzo(k)fluoranthene	330	87,000 C	UJ	86 J	46 J	1,900 J	1,600	93 J	67 J
Benzo(a)pyrene	330	870 C	37 J	110 J	56 J	2,000 J	1,600	62 J	59 J
Indeno(1,2,3-cd)pyrene	330	8,700 C	UJ	77 J	UJ	1,300 J	930	42 J	41 J
Dibenzo(a,h)anthracene	330	870 C	UJ	UJ	UJ	310 J	230 J		
Benzo(g,h,i)perylene	330	NTX	UJ	71 J	UJ	950 J	690	46 J	36 J
Benzoic Acid	1670	310,000,000 N							
Pesticides/PCBs									
Aldrin	2	380 C							
alpha-BHC	1.7	1,000 C					1.1 J		
beta-BHC	1.7	3,500 C				0.74 J	5.7 J		
delta-BHC	1.7	NTX							
gamma-BHC (Lindane)	1.7	4,900 C				3.4 J	6.9		
Heptachlor	1.7	1,400 C	4.6 B	3.2 B	4.5 B	2.4 B	2.3 B	3.0 B	2.7 B
Heptachlor Epoxide	2	700C							
Dieldrin	3.3	400 C				2.4 J	6.3 J		
4,4'-DDE	3.3	19,000 C					1.4 J		
Endrin	3.3	23,000 N				3.0 J			
Endosulfan I	2	NTX							
Endosulfan II	3.3	NTX							
4,4'-DDD	3.3	27,000 C					4.6 J		
Endosulfan sulfate	3.3	NTX				26 J	5.2 J		
4,4'-DDT	3.3	19,000 C				23 J	28 J		
Methoxychlor	17	390,000 N							
Endrin ketone	3.3	NTX							
Endrin aldehyde	3.3	NTX				4.9 J	12 J		
alpha-Chlordane	1.7	NTX	7.0 J						
gamma-Chlordane	1.7	NTX	7.7 B			1.6 B	1.9 B		

Notes:

CRQL = Contract Required Quantitation Limit

Flag = see Qualifier Code Glossaries

sample quantitation limits = CRQL X Dilution Factor

NTX = No Toxicity Information

RBC = USEPA Region III Risk-Based Concentration for Residential soil,
RBC table dated 10/05/00.

Table 2 (Page 5 of 7)
Summary of Organic Compound Detections
Sediment Samples
(ug/Kg)

Case:			28200	28200	28200	28200	28200	28200	28200
Sample Number :			C00Z9	C00ZB	C00ZC	C00Z7	C00Z8	C0101	C0103
Sampling Location :			KSL-SD21-03-600	KSL-SD22-03-600	KSL-SD28-03-600	KSL-SD23-03-600	KSL-SD26-03-600	KSL-SD24-03-600	KSL-SD25-03-600
Field QC:				Dup. Collected	Dup. (C00ZB)	Dup. Collected	Dup. (C00Z7)		
Matrix :			Soil	Soil	Soil	Soil	Soil	Soil	Soil
Units :			ug/Kg	ug/Kg	ug/Kg	ug/Kg	ug/Kg	ug/Kg	ug/Kg
Date Sampled :			06/23/2000	06/23/2000	06/23/2000	06/22/2000	06/22/2000	06/23/2000	06/23/2000
Time Sampled :			14:21	13:37	13:00	09:15	09:25	16:26	16:43
%Moisture :			48	36	29	34	32	26	31
pH :									
Dilution Factor :			1.0	1.0	1.0	1.0	1.0	1.0	1.0
Compound	**CRQL**	**RBC**	**Result Flag**	**Result Flag**	**Result Flag**	**Result Flag**	**Result Flag**	**Result Flag**	**Result Flag**
Volatile Organic Compounds									
Acetone	10	7,800,000 N	25 B						
Carbon Disulfide	10	7,800,000 N							
Methylene Chloride	10	850,000 C	15 B	6 B	6 B	15 B	14 B	2 B	29 B
2-Butanone	10	47,000,000 N							
1,1,1-Trichloroethane	10	22,000,000 N		4 J					
Carbon Tetrachloride	10	49,000 C							
Benzene	10	120,000 C							
Toluene	10	16,000,000 N							
Tetrachloroethene	10	120,000 C		3 J					
Chlorobenzene	10	1,600,000 N							
Ethylbenzene	10	7,800,000 N							
Xylenes (total)	10	160,000,000 N							
1,4-Dichlorobenzene	10	270,000 C							
Semivolatile Organic Compounds									
Benzaldehyde	330	7,800,000 N	200 B	130 B	120 B	30 B			
Phenol	330	47,000,000 N							
Acetophenone	330	7,800,000 N	40 B	32 B	59 B	27 B		55 B	66 B
4-Methylphenol	330	3,900,000 N	90 J	320 J	37 J *				
Naphthalene	330	16,000,000 N	130 J	77 J	190 J				
Caprolactam	330	39,000,000 N						26 B	
4-Chloro-3-methylphenol	330	NTX				30 J			
2-Methylnaphthalene	330	NTX	200 J	100 J	310 J				
1,1'-Biphenyl	330	3,900,000 N			39 J				
Acenaphthylene	330	NTX	60 J	400 J	160 J				
Acenaphthene	330	4,700,000 N		41 J					
Dibenzofuran	330	310,000 N	70 J	58 J	120 J				
Fluorene	330	3,100,000 N		32 J					
N-Nitrosodiphenylamine	330	1,300,000 C							
Phenanthrene	330	NTX	300 J	410 J	490	37 J	35 J		
Anthracene	330	23,000,000 N	56 J	670	190 J				
Carbazole	330	320,000 C		110 J	54 J				
Di-n-butylphthalate	330	NTX							
Fluoranthene	330	3,100,000 N	380 J	2,900	1,100	110 J	96 J		
Pyrene	330	2,300,000 N	550 J	4,900 +	1,800	150 J	95 J		
Butylbenzylphthalate	330	16,000,000 N							
Benzo(a)anthracene	330	8,700 C	300 J	2,600	1,000	70 J	53 J		
Chrysene	330	870,000 C	420 J	3,000	1,200	91 J	71 J		
bis(2-Ethylhexyl)phthalate	330	420,000 C	260 B	230 B	260 B	290 B	450 B	31 B	31 B
Di-n-octylphthalate	330	1,600,000 N		UJ	UJ		56 J		
Benzo(b)fluoranthene	330	8,700 C	540 J	3,900 J	1,600 J	120 J	90 J		
Benzo(k)fluoranthene	330	87,000 C	300 J	2,200 J	880 J	63 J	55 J		
Benzo(a)pyrene	330	870 C	270 J	1,900 J	800 J	64 J	51 J		
Indeno(1,2,3-cd)pyrene	330	8,700 C	280 J	1,500 J	640 J	51 J	40 J		
Dibenzo(a,h)anthracene	330	870 C	61 J	370 J	160 J				
Benzo(g,h,i)perylene	330	NTX	220 J	1,200 J	520 J	49 J	36 J		
Benzoic Acid	1670	310,000,000 N							
Pesticides/PCBs									
Aldrin	2	380 C							
alpha-BHC	1.7	1,000 C							
beta-BHC	1.7	3,500 C							
delta-BHC	1.7	NTX							
gamma-BHC (Lindane)	1.7	4,900 C							
Heptachlor	1.7	1,400 C	3.6 B	1.2 B	1.9 B	2.0 B	2.3 B	2.5 B	2.5 B
Heptachlor Epoxide	2	700C							
Dieldrin	3.3	400 C				2.8 J			
4,4'-DDE	3.3	19,000 C				19	13		
Endrin	3.3	23,000 N							
Endosulfan I	2	NTX							
Endosulfan II	3.3	NTX							
4,4'-DDD	3.3	27,000 C							
Endosulfan sulfate	3.3	NTX	3.3 J	1.9 J	10 J				
4,4'-DDT	3.3	19,000 C		7.5 J	5.6 J	21	12		
Methoxychlor	17	390,000 N		7.0 J					
Endrin ketone	3.3	NTX	3.9 J						
Endrin aldehyde	3.3	NTX		5.5 J					
alpha-Chlordane	1.7	NTX							
gamma-Chlordane	1.7	NTX							

Notes:
CRQL = Contract Required Quantitation Limit
Flag = see Qualifier Code Glossaries
sample quantitation limits = CRQL X Dilution Factor
NTX = No Toxicity Information
RBC = USEPA Region III Risk-Based Concentration for Residential soil,
RBC table dated 10/05/00.

Summary of Organic Compound Detections
Sediment Samples
(ug/Kg)

Case:			28200	28200	28200	28200	28200	28200	28200
Sample Number :			72506	72507	72508	72509	72510	72511	72512
Sampling Location :			KSL-SD-50-03-700	KSL-SD-51-03-700	KSL-SD-52-03-700	KSL-SD-58-03-700	KSL-SD-53-03-700	KSL-SD54-030700	KSL-SD-55-03-700
Field QC:					Dup. Collected	Dup. of 72508			
Matrix :			Soil	Soil	Soil	Soil	Soil	Soil	Soil
Units :			ug/Kg	ug/Kg	ug/Kg	ug/Kg	ug/Kg	ug/Kg	ug/Kg
Date Sampled :			7/21/2000	7/21/2000	7/21/2000	7/21/2000	7/21/2000	7/21/2000	7/21/2000
Time Sampled :			14:21	13:49	12:13	12:33	11:58	10:42	8:54
%Moisture :									
pH :									
Dilution Factor :									
Compound	CRQL	RBC	Result Flag	Result Flag	Result Flag	Result Flag	Result Flag	Result Flag	Result Flag
Volatile Organic Compounds									
Acetone	10	7,800,000 N	19 B	24 B	8 B	12 B	6 B	34 B	17 B
Carbon Disulfide	10	7,800,000 N							
Methylene Chloride	10	850,000 C							
2-Butanone	10	47,000,000 N						3 B	
1,1,1-Trichloroethane	10	22,000,000 N							
Carbon Tetrachloride	10	49,000 C							
Benzene	10	120,000 C							
Toluene	10	16,000,000 N							
Tetrachloroethene	10	120,000 C							
Chlorobenzene	10	1,600,000 N							
Ethylbenzene	10	7,800,000 N							
Xylenes (total)	10	160,000,000 N							
1,4-Dichlorobenzene	10	270,000 C							
Semivolatile Organic Compounds									
Benzaldehyde	330	7,800,000 N							
Phenol	330	47,000,000 N							
Acetophenone	330	7,800,000 N							
4-Methylphenol	330	3,900,000 N							
Naphthalene	330	16,000,000 N			50 J	70 J	70 J	60 J	50 J
Caprolactam	330	39,000,000 N							
4-Chloro-3-methylphenol	330	NTX							
2-Methylnaphthalene	330	NTX			70 J	70 J	100 J	60 J	60 J
1,1'-Biphenyl	330	3,900,000 N							
Acenaphthylene	330	NTX							
Acenaphthene	330	4,700,000 N							
Dibenzofuran	330	310,000 N							
Fluorene	330	3,100,000 N							
N-Nitrosodiphenylamine	330	1,300,000 C							
Phenanthrene	330	NTX	300 J		100 J	100 J	100 J	300 J	120 J
Anthracene	330	23,000,000 N						60 J	
Carbazole	330	320,000 C							
Di-n-butylphthalate	330	NTX							
Fluoranthene	330	3,100,000 N	160 J		100 J		300 J	300 J	110 J
Pyrene	330	2,300,000 N	140 J		70 J	100 J	300 J	300 J	110 J
Butylbenzylphthalate	330	16,000,000 N	300 J	540 J		100 J	300 J		500 J
Benzo(a)anthracene	330	8,700 C					120 J	100 J	
Chrysene	330	870,000 C	160 J		80 J	110 J	100 J	100 J	90 J
bis(2-Ethylhexyl)phthalate	330	420,000 C	190 B	420 B	120 B	100 B	300 B	120 B	90 B
Di-n-octylphthalate	330	1,600,000 N							
Benzo(b)fluoranthene	330	8,700 C					100 J	130 J	
Benzo(k)fluoranthene	330	87,000 C					90 J	90 J	
Benzo(a)pyrene	330	870 C					90 J	100 J	
Indeno(1,2,3-cd)pyrene	330	8,700 C					70 J		
Dibenzo(a,h)anthracene	330	870 C							
Benzo(g,h,i)perylene	330	NTX							
Benzoic Acid	1670	310,000,000 N						300 J	
Pesticides/PCBs									
Aldrin	2	380 C	15.7			5.7	6.1 R	5.4	5.1
alpha-BHC	1.7	1,000 C							
beta-BHC	1.7	3,500 C							
delta-BHC	1.7	NTX					6.4 J,R		
gamma-BHC (Lindane)	1.7	4,900 C							
Heptachlor	1.7	1,400 C	6.6 R		3.2 R				
Heptachlor Epoxide	2	700C			3.4 R		2.6 R		
Dieldrin	3.3	400 C							
4,4'-DDE	3.3	19,000 C							
Endrin	3.3	23,000 N							
Endosulfan I	2	NTX			2.3 R				
Endosulfan II	3.3	NTX					6.7		
4,4'-DDD	3.3	27,000 C							
Endosulfan sulfate	3.3	NTX	25.3 J						
4,4'-DDT	3.3	19,000 C							6.4 R
Methoxychlor	17	390,000 N							
Endrin ketone	3.3	NTX							
Endrin aldehyde	3.3	NTX							
alpha-Chlordane	1.7	NTX				3 R			
gamma-Chlordane	1.7	NTX							

Notes:
CRQL = Contract Required Quantitation Limit
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RBC table dated 10/05/00.

Table 2 (Page 7 of 7)
Summary of Organic Compound Detections
Sediment Samples
(ug/Kg)

Case:			28200	28200
Sample Number:			72513	72514
Sampling Location:			KSL-SD-56-03-700	KSL-SD-57-03-700
Field QC:				
Matrix:			Soil	Soil
Units:			ug/Kg	ug/Kg
Date Sampled:			7/21/2000	7/21/2000
Time Sampled:			9:14	9:34
%Moisture:				
pH:				
Dilution Factor:				
Compound	CRQL	RBC	Result Flag	Result Flag
Volatile Organic Compounds				
Acetone	10	7,800,000 N	13 B	246
Carbon Disulfide	10	7,800,000 N		
Methylene Chloride	10	850,000 C		
2-Butanone	10	47,000,000 N		34 B
1,1,1-Trichloroethane	10	22,000,000 N		
Carbon Tetrachloride	10	49,000 C		
Benzene	10	120,000 C		
Toluene	10	16,000,000 N		
Tetrachloroethene	10	120,000 C		
Chlorobenzene	10	1,600,000 N		
Ethylbenzene	10	7,800,000 N		
Xylenes (total)	10	160,000,000 N		
1,4-Dichlorobenzene	10	270,000 C		
Semivolatile Organic Compounds				
Benzaldehyde	330	7,800,000 N		
Phenol	330	47,000,000 N		
Acetophenone	330	7,800,000 N		
4-Methylphenol	330	3,900,000 N		
Naphthalene	330	16,000,000 N	60 J	
Caprolactam	330	39,000,000 N		
4-Chloro-3-methylphenol	330	NTX		
2-Methylnaphthalene	330	NTX	70 J	
1,1'-Biphenyl	330	3,900,000 N		
Acenaphthylene	330	NTX		
Acenaphthene	330	4,700,000 N		
Dibenzofuran	330	310,000 N		
Fluorene	330	3,100,000 N		
N-Nitrosodiphenylamine	330	1,300,000 C		
Phenanthrene	330	NTX	130 J	150 J
Anthracene	330	23,000,000 N		
Carbazole	330	320,000 C		
Di-n-butylphthalate	330	NTX		
Fluoranthene	330	3,100,000 N	110 J	200 J
Pyrene	330	2,300,000 N	110 J	170 J
Butylbenzylphthalate	330	16,000,000 N		
Benzo(a)anthracene	330	8,700 C		
Chrysene	330	870,000 C	100 J	170 J
bis(2-Ethylhexyl)phthalate	330	420,000 C	110 B	200 B
Di-n-octylphthalate	330	1,600,000 N		
Benzo(b)fluoranthene	330	8,700 C	70 J	
Benzo(k)fluoranthene	330	87,000 C		
Benzo(a)pyrene	330	870 C		
Indeno(1,2,3-cd)pyrene	330	8,700 C		
Dibenzo(a,h)anthracene	330	870 C		
Benzo(g,h,i)perylene	330	NTX		
Benzoic Acid	1670	310,000,000 N		500 J
Pesticides/PCBs				
Aldrin	2	380 C	8.4 R	9.1
alpha-BHC	1.7	1,000 C		
beta-BHC	1.7	3,500 C		
delta-BHC	1.7	NTX		
gamma-BHC (Lindane)	1.7	4,900 C		
Heptachlor	1.7	1,400 C		
Heptachlor Epoxide	2	700C	3.7 R	4.2 R
Dieldrin	3.3	400 C		
4,4'-DDE	3.3	19,000 C		
Endrin	3.3	23,000 N		
Endosulfan I	2	NTX		
Endosulfan II	3.3	NTX		
4,4'-DDD	3.3	27,000 C		
Endosulfan sulfate	3.3	NTX		
4,4'-DDT	3.3	19,000 C	9.5 R	
Methoxychlor	17	390,000 N		
Endrin ketone	3.3	NTX		
Endrin aldehyde	3.3	NTX	6.4 R	
alpha-Chlordane	1.7	NTX		
gamma-Chlordane	1.7	NTX		

Notes:

CRQL = Contract Required Quantitation Limit

Flag = see Qualifier Code Glossaries

sample quantitation limits = CRQL X Dilution Factor

NTX = No Toxicity Information

RBC = USEPA Region III Risk-Based Concentration for Residential soil,
RBC table dated 10/05/00.

Table 3 (6 pages)
Summary of Organic Compounds - Historical Sediment
Sample date: July 1997
ug/Kg

FIELD SAMPLE NUMBER		SD-06		SD-07		SD-08		SD-09		SD-10	
LABORATORY SAMPLE NUMBER		97072535		97072536		97072537		97072538		97072539	
NQL FACTOR		0.99		0.99		1		1		0.99	
PERCENT SOLID (105°C)		50.3		23.9		58.1		59.0		41.3	
								Background			
HAZARDOUS SUBSTANCE											
Volatile Organics	NQL										
Acetone	5	29	B	13	B	—		6	B	4	B
Benzene	5	—		—		—		—		—	
2-Butanone	5	7.2		—		—		—		—	
N-Butylbenzene	5	—		—		—		—		—	
Sec-Butylbenzene	5	—		—		—		—		—	
Carbon Disulfide	5	—		—		—		—		—	
Chlorobenzene	5	—		—		—		—		—	
Chloroethane	5	—		—		—		—		—	
2-Chloroethylvinyl Ether	5	—	UJ	—	UJ	—	UJ	—	UJ	—	UJ
2-Chlorotoluene	5	—		—		—		—		—	
4-Chlorotoluene	5	—		—		—		—		—	
1,4-Dichlorobenzene	5	—		—		—		—		—	
Dichlorodifluoromethane	5	—	UJ	—	UJ	—	UJ	—	UJ	—	UJ
Cis-1,2-Dichloroethene	5	—		—		—		—		—	
Ethyl Benzene	5	—		—		—		—		—	
Isopropylbenzene	5	—		—		—		—		—	
Methylene Chloride	5	1	B	1	B	1	B	2	B	1	B
Naphthalene	5	—		—		—		—		—	
N-Propylbenzene	5	—		—		—		—		—	
Toluene	5	—		—		—		—		—	
1,2,4-Trimethylbenzene	5	—		—		—		—		—	
1,3,5-Trimethylbenzene	5	—		—		—		—		—	
Vinyl Acetate	5	—		—		—		—		—	
Vinyl Chloride	5	—	UJ	—	UJ	—	UJ	—	UJ	—	UJ
O-Xylene	10	—		—		—		—		—	
M&P-Xylene Isomers	5	—		—		—		—		—	

NOTES:

ug/Kg - micrograms per Kilogram   Sample quantitation limit = NQL * NQL FACTOR

NQL - Nominal Quantitation Limit

---- Not Detected

B - Not Detected. Substantially above the level reported in laboratory or field blanks.

UJ - Not detected. Quantitation limit is estimated.

Source:
Table 4, Weston Site Inspection Report
dated August 31, 1998

Table 3 (6 pages)
Summary of Organic Compounds - Historical Sediment
Sample date: July 1997
ug/Kg

FIELD SAMPLE NUMBER		SD-11		SD-12		SD-13		SD-14		SD-15	
LABORATORY SAMPLE NO.		97072540		97072541		97072542		97072543		97072544	
NQL FACTOR		0.99		1		1		1		1	
PERCENT SOLID (105°C)		74.4		74.3		40.7		62.5		33.4	
										Duplicate of SD-04	
HAZARDOUS SUBSTANCE											
Volatile Organics	**NQL**										
Acetone	5	6	B	7	B	6.7		5.0		9.6	
Benzene	5	—		—		—		—			
2-Butanone	5	—		—		2	J	—		2	J
N-Butylbenzene	5	—		—		—		—		—	
Sec-Butylbenzene	5	—		—		—		—		—	
Carbon Disulfide	5	—		—		—		—		—	
Chlorobenzene	5	—		—		—		—		—	
Chloroethane	5	—		—		—		—		—	
2-Chloroethylvinyl Ether	5	—	UJ	—	UJ	—	UJ	—	UJ	—	UJ
2-Chlorotoluene	5	—		—		—		—		—	
4-Chlorotoluene	5	—		—		—		—		—	
1,4-Dichlorobenzene	5	—		—		—		—		—	
Dichlorodifluoromethane	5	—	UJ	—	UJ	—		—		—	
Cis-1,2-Dichloroethene	5	—		—		—		—		—	
Ethyl Benzene	5	—		—		—		—		—	
Isopropylbenzene	5	—		—		—		—		—	
Methylene Chloride	5	1	B	1	B	1	B	0.9	B	1	B
Naphthalene	5	—		—		—		—		—	
N-Propylbenzene	5	—		—		—		—		—	
Toluene	5	—		—		—		—		—	
1,2,4-Trimethylbenzene	5	—		—		—		—		—	
1,3,5-Trimethylbenzene	5	—		—		—		—		—	
Vinyl Acetate	5	—		—		—		—		—	
Vinyl Chloride	5	—	UJ	—	UJ	—		—		—	
O-Xylene	10	—		—		—		—		—	
M&P-Xylene Isomers	5	—		—		—		—		—	

Notes:
ug/Kg - micrograms per Kilogram
Sample quantitation limit = NQL * NQL FACTOR
NQL - Nominal Quantitation Limit
B - Not Detected. Substantially above the level reported in laboratory or field blanks.
— - Not Detected
J - Analyte present. Reported value is estimated; concentration is outside the range of accurate quantitation.
UJ - Not detected. Quantitation limit is estimated.

Source:
Table 4, Weston Site Inspection Report
dated August 31, 1998

Table 3 (6 pages)
Summary of Organic Compounds - Historical Sediment
Sample date: July 1997
mg/Kg

FIELD SAMPLE NUMBER		SD-01		SD-02		SD-03		SD-04		SD-05	
LABORATORY SAMPLE NUMBER		97072530		97072531		97072532		97072533		97072534	
NQL FACTOR		1		1		1		1		1	
PERCENT SOLID (105°C)		58.8		73.3		79.3		33.1		25.4	
						Background					
HAZARDOUS SUBSTANCE											
Semivolatile Organics	NQL										
Acenapthene	0.33	—		0.1	J	—		—		—	
Anthracene	0.33	—		0.36		—		—		—	
Benzo(a)Anthracene	0.33	0.06	J	0.97		—		—		—	
Benzo(a)Pyrene	0.33	0.04	J	0.67		—		0.04	J	—	
Benzo(b)Fluoranthene	0.33	0.05	J	0.69		—		0.05	J	0.06	J
Benzo(g,h,i) Perylene	0.33	—		0.37		—		—		—	
Benzo(k)Fluoranthene	0.33	0.04	J	0.59		—		0.04	J	0.05	J
Benzyl Alcohol	0.33	—		—	UJ	—	UJ	—	UJ	—	UJ
Bis (2-Ethylhexyl) Phthalate	0.33							0.08	J		
Carbazole	0.33	—		0.08	J	—				—	
Chrysene	0.33	—		1.14		—		—		—	
Di-n-Butylphthalate	0.33	—		—		—		—		—	
Dibenzo(a,h)Anthracene	0.33	—		0.2	J	—		—		—	
Dibenzofuran	0.33	—		0.08	J	—		—		—	
3,3'-Dichlorobenzidine	0.67	—		—	UJ	—	UJ	—	UJ	—	UJ
Diethylphthalate	0.33	—		—		—		—		—	
Fluoranthene	0.33	0.1	J	2.49		—		0.07	J	0.08	J
Fluorene	0.33	—		0.1	J	—		—		—	
Hexachlorocyclopentadiene	0.33	—	UJ	—	UJ	—	UJ	—	UJ	—	UJ
Indeno(1,2,3-cd)Pyrene	0.33	—		0.34		—		—		—	
2-Methylnaphthalene	0.33	—		0.2	J	—		—		—	
4-Methylphenol	0.33	0.04	J	—		0.04	J	—		—	
Naphthalene	0.33	—		0.08	J	—		—		—	
4-Nitroaniline	1.67	—		—		—		—		—	
N-Nitrosodiphenylamine	0.33					—		0.08	J	—	
Phenanthrene	0.33	0.07	J	1.24		—		—		0.04	J
Phenol	0.33	—		—		—		—		—	
Pyrene	0.33	0.1	J	1.57		—		0.06	J	0.07	J
PCB and Pesticides	NQL										
4,4' -DDT	0.003	—		—		—		—		—	
Beta BHC	0.002	0.0097	R	—		—		—		—	
Endosulfan Sulfate	0.003	—		—		0.025	RJ	—		—	
Endrin Aldehyde	0.003	—		—		—		—		—	
Gamma Chlordane	0.002	—		—		—		—		—	

NOTES:

mg/Kg - milligrams per Kilogram

Sample quantitation limit = NQL * NQL FACTOR

NQL - Nominal Quantitation Limit

— - Not Detected

J - Analyte present. Reported value is estimated; concentration is outside the range of accurate quantitation.

UJ - Not detected. Quantitation limit is estimated.

R - Unreliable results. Analyte may or may not be present in the sample. Supporting data is necessary to confirm results.

Source:
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dated August 31, 1998

Table 3 (6 pages)
Summary of Organic Compounds - Historical Sediment
Sample date: July 1997
mg/Kg

FIELD SAMPLE NUMBER		SD-06		SD-07		SD-08		SD-09		SD-10	
LABORATORY SAMPLE NUMBER		97072535		97072536		97072537		97072538		97072539	
NQL FACTOR		1		1		1		1		1	
PERCENT SOLID (105°C)		50.3		23.9		58.1		59.0		41.8	
								Background			
HAZARDOUS SUBSTANCE											
Semivolatile Organics	NQL										
Acenaphthene	0.33	—		—		—		—		—	
Anthracene	0.33	—		—		—		—		—	
Benzo(a)Anthracene	0.33	—		—		—		—		—	
Benzo(a)Pyrene	0.33	—		0.04	J	—		—		—	
Benzo(b)Fluoranthene	0.33	—		—		—		—		—	
Benzo(g,h,i) Perylene	0.33	—		—		—		—		—	
Benzo(k)Fluoranthene	0.33	—		—		—		—		—	
Benzyl Alcohol	0.33	—	UJ	—	UJ	—		—		—	
Bis (2-Ethylhexyl)Phthalate	0.33	—		—		0.1	J	—		—	
Carbazole	0.33	—		—		—		—		—	
Chrysene	0.33	—		—		—		—		—	
Di-n-Butylphthalate	0.33	—		—		—		—		—	
Dibenzo(a,h)Anthracene	0.33	—		—		—		—		—	
Dibenzofuran	0.33	—		—		—		—		—	
3,3'-Dichlorobenzidine	0.67	—	UJ	—	UJ	—		—		—	
Diethylphthalate	0.33	—		—		—		—		—	
Fluoranthene	0.33	0.04	J	0.09	J	—		—		—	
Fluorene	0.33	—		—		—		—		—	
Hexachlorocyclopentadiene	0.33	—	UJ	—	UJ	—	UJ	—	UJ	—	UJ
Indeno(1,2,3-cd)Pyrene	0.33	—		—		—		—		—	
2-Methylnaphthalene	0.33	—		—		—		—		0.05	J
4-Methylphenol	0.33	—		0.03	J	—		—		—	
Naphthalene	0.33	—		—		—		—		0.04	J
4-Nitroaniline	0.33	—		—		—		—		—	
N-Nitrosodiphenylamine	0.33	—		—		—		—		0.2	J
Phenanthrene	0.33	0.06	J	—		—		—		0.08	J
Phenol	0.33	—		—		—		—		—	
Pyrene	0.33	—		0.07	J	—		—		—	
PCB and Pesticides	NQL										
4,4'-DDT	0.003	—		—		—		0.019	J	—	
Beta BHC	0.002	0.054	R	—		—		—		—	
Endosulfan Sulfate	0.003	0.062	R	—		—		—		—	
Endrin Aldehyde	0.003	—		—		—		—		—	
Gamma Chlordane	0.002	0.0086	R	—		—		—		—	

NOTES:
mg/Kg - milligrams per Kilogram
NQL - Nominal Quantitation Limit
--- Not Detected
B - Not Detected. Substantially above the level reported in laboratory or field blanks.
J - Analyte present. Reported value is estimated; concentration is outside the range of accurate quantitation.
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Sample quantitation limit = NQL * NQL FACTOR.

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Table 3 (6 pages)
Summary of Organic Compounds - Historical Sediment
Sample date: July 1997
mg/Kg

FIELD SAMPLE NUMBER		SD-11		SD-12		SD-13		SD-14		SD-15	
LABORATORY SAMPLE NO.		97072540		97072541		97072542		97072543		97072544	
NQL FACTOR		1		1		1		1		1	
PERCENT SOLID (105°C)		74.4		74.3		40.7		62.5		33.4	
										Duplicate of SD-04	
HAZARDOUS SUBSTANCE											
Semivolatile Organics	**NQL**										
Acenapthene	0.33	—		—		—		—		—	
Benzo(a)Anthracene	0.33	—		—		—		—		—	
Benzo(a)Pyrene	0.33	—		—		—		—		0.03	J
Benzo(b)Fluoranthene	0.33	—		—		—		—		0.04	J
Benzo(g,h,i) Perylene	0.33	—		—		—		—		—	
Benzo(k)Fluoranthene	0.33	—		—		—		—		0.03	J
Benzyl Alcohol	0.33	—		—		—		—		—	
Bis (2-Ethylhexyl)Phthalate	0.33	—		—		0.04	J	0.05	J	0.06	J
Carbazole	0.33	—		—		—		—		—	
Chrysene	0.33	—		—		—		—		0.05	J
Di-n-Butylphthalate	0.33	—		—		—		—		—	
Dibenzo(a,h)Anthracene	0.33	—		—		—		—		—	
Dibenzofuran	0.33	—		—		—		—		—	
3,3'-Dichlorobenzidine	0.67	—		—		—		—		—	
Diethylphthalate	0.33	—		—		—		—		—	
Fluoranthene	0.33	0.03	J	—		—		0.04	J	0.07	J
Fluorene	0.33	—		—		—		—		—	
Hexachlorocyclopentadiene	0.33	—	UJ	—	UJ	—	UJ	—	UJ	—	UJ
Indeno(1,2,3-cd)Pyrene	0.33	—		—		—		—		—	
2-Methylnaphthalene	0.33	—		—		—		—		—	
4-Methylphenol	0.33	—		—		—		—		—	
Naphthalene	0.33	—		—		—		—		—	
4-Nitroaniline	0.33	—		—		—		—		—	
N-Nitrosodiphenylamine	0.33	0.07	J	—		0.04	J	—		0.07	J
Phenanthrene	0.33	—		—		—		—		0.04	J
Phenol	0.33	—		—		—		—		—	
Pyrene	0.33	—		—		—		—		0.06	J
PCB and Pesticides	**NQL**										
4,4' -DDT	0.003	—		0.024	J	0.024	J	0.052	J	0.19	J
Beta BHC	0.002	—		—		—		—		—	
Endosulfan Sulfate	0.003	—		—		0.018	R	—		—	
Endrin Aldehyde	0.003	—		—		—		—		—	
Gamma Chlordane	0.002	—		—		—		—		—	

Notes:
mg/Kg - milligrams per Kilogram   Sample quantitation limit = NQL * NQL FACTOR
NQL - Nominal Quantitation Limit
— - Not Detected
J - Analyte present. Reported value is estimated; concentration is outside the range of accurate quantitation.
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Source:
Table 4, Weston Site Inspection Report
dated August 31, 1998

Table 3 (6 pages)
Summary of Organic Compounds - Historical Sediment
Sample date: July 1997
ug/Kg

FIELD SAMPLE NUMBER		SD-01		SD-02		SD-03		SD-04		SD-05	
LABORATORY SAMPLE NUMBER		97072530		97072531		97072532		97072533		97072534	
NQL FACTOR		0.99		1		0.99		0.99		1	
PERCENT SOLID (105°C)		58.8		73.3		79.3		33.1		25.4	
						Background					
HAZARDOUS SUBSTANCE											
Volatile Organics	NQL										
Acetone	5	7	B	3	B	—		11	B	10	B
Benzene	5	—		—		—		—		—	
2-Butanone	5	—		—		—		—		2	J
N-Butylbenzene	5	—		—		—		—		—	
Sec-Butylbenzene	5	—		—		—		—		—	
Carbon Disulfide	5	—		—		—		0.8	J	—	
Chlorobenzene	5	—		—		—		—		—	
Chloroethane	5	—		—		—		—		—	
2-Chloroethylvinyl Ether	5	—	UJ	—	UJ	—	UJ	—	UJ	—	UJ
2-Chlorotoluene	5	—		—		—		—		—	
4-Chlorotoluene	5	—		—		—		—		—	
1,4-Dichlorobenzene	5	—		—		—		—		—	
Dichlorodifluoromethane	5	—	UJ	—	UJ	—	UJ	—	UJ	—	UJ
Cis-1,2-Dichloroethene	5	—		—		—		—		—	
Ethyl Benzene	5	—		—		—		—		—	
Isopropylbenzene	5	—		—		—		—		—	
Methylene Chloride	5	2	B	1	B	2	B	1	B	1	B
Naphthalene	5	0.6	B	—		—		—		—	
N-Propylbenzene	5	—		—		—		—		—	
Toluene	5	—		—		—		—		—	
1,2,4-Trimethylbenzene	5	—		—		—		—		—	
1,3,5-Trimethylbenzene	5	—		—		—		—		—	
Vinyl Acetate	5	—		—		—		—		—	
Vinyl Chloride	5	—	UJ	—	UJ	—	UJ	—	UJ	—	UJ
O-Xylene	10	—		—		—		—		—	
M&P-Xylene Isomers	5	—		—		—		—		—	

NOTES:

ug/Kg - micrograms per Kilogram

Sample quantitation limit = NQL * NQL FACTOR

NQL - Nominal Quantitation Limit

— - Not Detected

B - Not Detected. Substantially above the level reported in laboratory or field blanks.

J - Analyte present. Reported value is estimated; concentration is outside the range of accurate quantitation.

UJ - Not detected. Quantitation limit is estimated.

Source:
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dated August 31, 1998

Table 4 (Page 1 of 8)
Summary of Inorganic Analyte Detections
Current Sediment Samples
(mg/Kg)

Case:			28200		28200		28200		28200		28200	
Sample Number :			MC0050		MC004X		MC004Y		MC004Z		MC004S	
Sampling Location :			KSL-SD01-03-600		KSL-SD02-03-600		KSL-SD03-03-600		KSL-SD04-03-600		KSL-SD05-03-600	
Matrix :			Soil		Soil		Soil		Soil		Soil	
Units :			mg/Kg		mg/Kg		mg/Kg		mg/Kg		mg/Kg	
Date Sampled :			06/22/2000		06/22/2000		06/22/2000		06/22/2000		06/22/2000	
Time Sampled :			08:35		19:15		19:35		17:40		17:15	
%Solids :			73.6		55.7		79.9		66.4		59.5	
Dilution Factor :			1.0		1.0		1.0		1.0		1.0	
Field QC :												
ANALYTE	**CRDL**	**RBC**	**Result**	**Flag**	**Result**	**Flag**	**Result**	**Flag**	**Result**	**Flag**	**Result**	**Flag**
ALUMINUM	40	7,800 N	7,800		6,450		3,880		4,750		5,350	
ANTIMONY	12	3.1 N										
ARSENIC	2	0.43 C	23.0		13.7		11.0		11.8		12.7	
BARIUM	40	550 N	527		147		207		275		341	
BERYLLIUM	1	16 N	3.7		[0.98]		[0.47]		[0.90]		[1.1]	
CADMIUM	1	3.9 N	2.7		[0.60]						[0.51]	
CALCIUM	1000	NTX	2,390		5,880		3,920		3,200		6,010	
CHROMIUM	2	12,000 N	25.5		13.1		11.4		10.7		10.1	
COBALT	10	470 N	36.5		[12.0]		[10.7]		[8.8]		[14.3]	
COPPER	5	310 N	95.9		55.2		27.2		31.4		40.6	
IRON	20	2,300 N	50,100		25,500		30,300		22,000		24,200	
LEAD	0.6	400 (action level)	56.2		26.6		40.8		37.9		38.8	
MAGNESIUM	1000	NTX	[482]		[576]		[628]		[416]		[604]	
MANGANESE	3	160 N	1,660		582		732		439		1,120	
MERCURY	0.1	2.3 N		UL		UL		UL		UL	[0.09]	L
NICKEL	8	160 N	133		22.8		13.2		21.1		35.8	
POTASSIUM	1000	NTX	[1,080]	J	[733]	J	[547]	J	[545]	J	[670]	J
SELENIUM	1	39 N		UL	3.2	L		UL		UL		UL
SILVER	2	39 N	[1.2]				[0.63]					
SODIUM	1000	NTX	[122]	J	[210]	J	[138]	J	[141]	J	[188]	J
THALLIUM	2	0.55 N										
VANADIUM	10	55 N	56.6		25.1		16.3		20.2		21.2	
ZINC	4	2,300 N	1,080		337		396		325		538	
CYANIDE	0.5	160 N		UL		UL		UL		UL		UL

Notes:

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NTX = No Toxicity Information

RBC = USEPA Region III Risk-Based Concentration
for Residential soil, RBC table dated 10/05/00.

Table 4 (Page 2 of 8)
Summary of Inorganic Analyte Detections
Current Sediment Samples
(mg/Kg)

Case:			28200		28200		28200		28200		28200		28200	
Sample Number :			MC004T		MC004P		MC004W		MCYB13		MCYB14		MCYB15	
Sampling Location :			KSL-SD06-03-600		KSL-SD27-03-600		KSL-SD07-03-600		KSL-SD08-03-600		KSL-SD09-03-600		KSL-SD10-03-600	
Matrix :			Soil		Soil		Soil		Soil		Soil		Soil	
Units :			mg/Kg		mg/Kg		mg/Kg		mg/Kg		mg/Kg		mg/Kg	
Date Sampled :			06/22/2000		06/22/2000		06/22/2000		06/22/2000		06/22/2000		06/22/2000	
Time Sampled :			18:30		18:05		16:45		14:50		14:25		13:58	
%Solids :			36.2		45.7		30.3		71.0		53.9		74.1	
Dilution Factor :			1.0		1.0		1.0		1.0		1.0		1.0	
Field QC :			Dup. Collected		Dup. of MC004T									
ANALYTE	**CRDL**	**RBC**	**Result**	**Flag**	**Result**	**Flag**	**Result**	**Flag**	**Result**	**Flag**	**Result**	**Flag**	**Result**	**Flag**
ALUMINUM	40	7,800 N	1,920		4,180		5,670		5,970		4,500		5,300	
ANTIMONY	12	3.1 N									[1.9]	B		
ARSENIC	2	0.43 C	79.8		17.4		30.3		19.6		13.0		14.2	
BARIUM	40	550 N	2,330		982		1,380		327		373		290	
BERYLLIUM	1	16 N	[0.15]		[0.33]		[0.64]		1.8		[0.59]		[0.98]	
CADMIUM	1	3.9 N									[0.76]			
CALCIUM	1000	NTX	66,800		67,800		8,710		5,350		7,560		3,770	
CHROMIUM	2	12,000 N	9.7	K	9.0		11.8	K	17.6		9.7		13.4	
COBALT	10	470 N	[10.0]		[7.4]		[9.8]		15.0		21.1		19.0	
COPPER	5	310 N	18.3		19.7		39.7		54.6		45.7		54.7	
IRON	20	2,300 N	224,000		64,300		115,000		44,400		25,700		33,700	
LEAD	0.6	400 (action level)			5.8		31		22.8		22.5		30.4	
MAGNESIUM	1000	NTX	[1,470]		[2,040]		[925]		[952]		[1,260]		1,620	
MANGANESE	3	160 N	1,150		1,810		604		1,110		1,860		1,850	
MERCURY	0.1	2.3 N		UL			[0.17]	L		UL	[0.14]	L	[0.09]	L
NICKEL	8	160 N	[7.0]		[10.7]		[19.8]		38.8		54.9		55.1	
POTASSIUM	1000	NTX	[673]	J	[770]	J	[870]	J	[792]	J	[810]	J	[605]	J
SELENIUM	1	39 N		UL		UL		UL		UL		UL		UL
SILVER	2	39 N	[3.1]		[1.2]		[1.9]		[0.92]		[0.75]		[0.76]	
SODIUM	1000	NTX	[1,220]	J	[1,020]	J	[655]	J	[255]	J	[341]	J	[303]	J
THALLIUM	2	0.55 N												
VANADIUM	10	55 N	[16.3]		[13.7]		[26.1]		29.6		20.1		24.8	
ZINC	4	2,300 N	103		112		372		214		333		301	
CYANIDE	0.5	160 N		UL		UL		UL		UL		UL		UL

Notes:

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Table 4 (Page 3 of 8)
Summary of Inorganic Analyte Detections
Current Sediment Samples
(mg/Kg)

Case:			28200		28200		28200		28200		28200		28200	
Sample Number :			MCYB16		MCYB17		MCYB18		MCYB20		MCYB19		MCYB21	
Sampling Location :			KSL-SD11-03-600		KSL-SD12-03-600		KSL-SD13-03-600		KSL-SD13-12-600		KSL-SD14-03-600		KSL-SD14-12-600	
Matrix :			Soil		Soil		Soil		Soil		Soil		Soil	
Units :			mg/Kg		mg/Kg		mg/Kg		mg/Kg		mg/Kg		mg/Kg	
Date Sampled :			06/22/2000		06/22/2000		06/23/2000		06/23/2000		06/23/2000		06/23/2000	
Time Sampled :			15:15		15:30		10:44		10:53		09:58		10:12	
%Solids :			52.8		39.5		78.3		57.7		43.8		61.8	
Dilution Factor :			1.0		1.0		1.0		1.0		1.0		1.0	
Field QC :														
ANALYTE	**CRDL**	**RBC**	**Result**	**Flag**	**Result**	**Flag**	**Result**	**Flag**	**Result**	**Flag**	**Result**	**Flag**	**Result**	**Flag**
ALUMINUM	40	7,800 N	6,590		6,810		3,920		6,160		7,600		8,940	
ANTIMONY	12	3.1 N												
ARSENIC	2	0.43 C	11.9		13.5	B	10.6		8.5	B	17.8		14.5	
BARIUM	40	550 N	407		268		282		397		578		334	
BERYLLIUM	1	16 N	[0.69]		[1.3]		[0.62]		[0.98]		[0.73]		[0.72]	
CADMIUM	1	3.9 N	[0.56]								[1.0]		[0.26]	
CALCIUM	1000	NTX	4,840		2,920		2,180		4,740		6,310		10,800	
CHROMIUM	2	12,000 N	10.0		9.2		9.6		12.4		12.7		13.0	
COBALT	10	470 N	[18.0]		[18.7]		[9.3]		[11.7]		[19.1]		[11.9]	
COPPER	5	310 N	60.8		40.6		33.0		41.6		61.2		65.4	
IRON	20	2,300 N	22,500		22,900		26,700		21,100		66,900		32,700	
LEAD	0.6	400 (action level)	32.2		186		16.4		39.9		30.3		36.1	
MAGNESIUM	1000	NTX	[1,110]		[724]		[728]		[1,170]		[1,080]		[1,000]	
MANGANESE	3	160 N	355		555		386		188		750		862	
MERCURY	0.1	2.3 N	[0.16]	L					0.36		[0.17]	B	0.20	B
NICKEL	8	160 N	36.0		23.4		25.1		30.5		49.7		31.2	
POTASSIUM	1000	NTX	[1,080]	J	[735]	J	[594]	J	[700]	J	[1,110]	J	[1,280]	J
SELENIUM	1	39 N		UL		UL		UL		UL		UL		UL
SILVER	2	39 N					[0.59]				[1.5]		[0.88]	
SODIUM	1000	NTX	[222]	J	[349]	J	[217]	J	[445]	J	[266]		[251]	
THALLIUM	2	0.55 N												
VANADIUM	10	55 N	25.2		[23.9]		18.6		17.3		27.4		32.4	
ZINC	4	2,300 N	296		222		166		237		678		237	
CYANIDE	0.5	160 N		UL		UL		UL	1.3			UL		UL

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Table 4 (Page 4 of 8)
Summary of Inorganic Analyte Detections
Current Sediment Samples
(mg/Kg)

Case:			28200	28200	28200	28200	28200	28200
Sample Number :			MCYB22	MCYB23	MCYB24	MC004N	MCYB25	MC0056
Sampling Location :			KSL-SD15-03-600	KSL-SD15-12-600	KSL-SD16-03-600	KSL-SD29-03-600	KSL-SD16-12-600	KSL-SD17-03-600
Matrix :			Soil	Soil	Soil	Soil	Soil	Soil
Units :			mg/Kg	mg/Kg	mg/Kg	mg/Kg	mg/Kg	mg/Kg
Date Sampled :			06/23/2000	06/23/2000	06/23/2000	06/23/2000	06/23/2000	06/22/2000
Time Sampled :			09:25	09:37	08:25	08:00	08:45	12:05
%Solids :			42.1	49.5	47.8	48.8	54.2	38.5
Dilution Factor :			1.0	1.0	1.0	1.0	1.0	1.0
Field QC :					Dup. Collected	Dup of MCYB24		
ANALYTE	**CRDL**	**RBC**	**Result Flag**	**Result Flag**	**Result Flag**	**Result Flag**	**Result Flag**	**Result Flag**
ALUMINUM	40	7,800 N	7,970	6,390	5,790	3,830	7,090	6,450
ANTIMONY	12	3.1 N						
ARSENIC	2	0.43 C	13.5 B	9.0 B	6.9 B	7.0 B	4.2 B	14.0 B
BARIUM	40	550 N	614	235	385	317	226	284
BERYLLIUM	1	16 N	[0.76]	[0.99]	[0.79]	[0.60]	[0.18]	[0.75]
CADMIUM	1	3.9 N	[0.59]	[1.2]	[0.46]			[0.83]
CALCIUM	1000	NTX	5,100	3,720	3,940	3,870	2,930	3,700
CHROMIUM	2	12,000 N	13.9	14.2	12.3	9.0	12.8	14.4
COBALT	10	470 N	[19.7]	[10.7]	[11.4]	[7.8]	[4.5]	[10.8]
COPPER	5	310 N	57.1	46.2	42.8	31.2	28.6	55.2
IRON	20	2,300 N	33,200	13,600	18,000	14,500	10,100	28,400
LEAD	0.6	400 (action level)	33.3	37.2	30.8	20.1	32.7	27.6
MAGNESIUM	1000	NTX	[1,350]	[915]	[1,270]	[1,120]	[1,200]	[1,090]
MANGANESE	3	160 N	417	128	145	145	138	399
MERCURY	0.1	2.3 N	R	0.27 B	0.33 B	0.29 B	R	[0.18]
NICKEL	8	160 N	48.8	44.4	42.3	29.3	15.3	44.8
POTASSIUM	1000	NTX	[1,370] J	[666] J	[865] J	[635] J	[1,190] J	[835] J
SELENIUM	1	39 N	3.6 L	[1.9] L	[1.7] L		2.5 L	UL
SILVER	2	39 N	[0.88]					
SODIUM	1000	NTX	[605]	[458]	[462]	[497]	[396]	[391] J
THALLIUM	2	0.55 N						
VANADIUM	10	55 N	27.5	20.7	[17.3]	[12.5]	25.2	[22.0]
ZINC	4	2,300 N	434	390	275	195	80.2	322
CYANIDE	0.5	160 N	UL	UL	UL	UL	UL	UL

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Table 4 (Page 5 of 8)
Summary of Inorganic Analyte Detections
Current Sediment Samples
(mg/Kg)

Case:			28200		28200		28200		28200		28200		28200	
Sample Number :			MC0057		MCYB26		MCYB27		MCYB28		MCYB29		MC0053	
Sampling Location :			KSL-SD18-03-600		KSL-SD19-03-600		KSL-SD19-12-600		KSL-SD20-03-600		KSL-SD20-12-600		KSL-SD21-03-600	
Matrix :			Soil		Soil		Soil		Soil		Soil		Soil	
Units :			mg/Kg		mg/Kg		mg/Kg		mg/Kg		mg/Kg		mg/Kg	
Date Sampled :			06/22/2000		06/23/2000		06/23/2000		06/23/2000		06/23/2000		06/23/2000	
Time Sampled :			11:30		15:15		15:22		14:39		14:42		14:21	
%Solids :			27.0		38.9		50.7		61.5		35.9		36.7	
Dilution Factor :			1.0		1.0		1.0		1.0		1.0		1.0	
Field QC :														
ANALYTE	**CRDL**	**RBC**	**Result**	**Flag**	**Result**	**Flag**	**Result**	**Flag**	**Result**	**Flag**	**Result**	**Flag**	**Result**	**Flag**
ALUMINUM	40	7,800 N	5,410		6,750		8,110		6,290		6,880		5,130	
ANTIMONY	12	3.1 N											[5.6]	B
ARSENIC	2	0.43 C	35.3		11.2	B	8.6	B	22.5		16.4	B	72.1	
BARIUM	40	550 N	355		212		255		514		242		295	
BERYLLIUM	1	16 N	[1.1]		[1.0]		[1.3]		[0.57]		[0.92]		[1.2]	
CADMIUM	1	3.9 N			[0.90]		[0.58]				9.5		[0.72]	
CALCIUM	1000	NTX	4,920		7,360		6,240		3,150		5,850		9,600	
CHROMIUM	2	12,000 N	8.6	K	12.6		15.1		11.2		11.4		13.6	
COBALT	10	470 N	[18.6]		[12.3]		[12.5]		[9.2]		[15.0]		[15.9]	
COPPER	5	310 N	50.6		40.8		46.8		72.1		80.3		141	
IRON	20	2,300 N	91,100		23,800		19,700		29,700		25,100		19,600	
LEAD	0.6	400 (action level)	42.8		48.6		47.0		44.8		66.8		48.5	
MAGNESIUM	1000	NTX	[737]		[1,260]		[1,420]		1,800		[1,300]		[1,330]	
MANGANESE	3	160 N	672		762		599		287		228		515	
MERCURY	0.1	2.3 N	0.37		[0.17]	B	[0.18]	B	[0.13]	B	[0.15]	B	0.28	B
NICKEL	8	160 N	43.0		54.4		43.0		49.6		96.3		38.6	
POTASSIUM	1000	NTX	[741]	J	[685]	J	[718]	J	[995]	J	[1,060]	J	[745]	J
SELENIUM	1	39 N		UL	[2.5]	L		UL	2.1	L	7.1		3.5	L
SILVER	2	39 N							[1.3]					
SODIUM	1000	NTX	[273]	J	[213]		[200]		[180]		[292]		[302]	
THALLIUM	2	0.55 N					[3.6]	K						
VANADIUM	10	55 N	[18.9]		[18.4]		21.0		21.0		[22.3]		[17.1]	
ZINC	4	2,300 N	376		291		280		161		440		224	
CYANIDE	0.5	160 N		UL	[0.78]	L		UL	[0.49]	L		UL		UL

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Table 4 (Page 6 of 8)
Summary of Inorganic Analyte Detections
Current Sediment Samples
(mg/Kg)

Case:			28200		28200		28200		28200		28200		28200	
Sample Number :			MC0054		MC0055		MC0051		MC0052		MCYB30		MC0030	
Sampling Location :			KSL-SD22-03-600		KSL-SD28-03-600		KSL-SD23-03-600		KSL-SD26-03-600		KSL-SD24-03-600		KSL-SD25-03-600	
Matrix :			Soil		Soil		Soil		Soil		Soil		Soil	
Units :			mg/Kg		mg/Kg		mg/Kg		mg/Kg		mg/Kg		mg/Kg	
Date Sampled :			06/23/2000		06/23/2000		06/22/2000		06/22/2000		06/23/2000		06/23/2000	
Time Sampled :			13:37		13:00		09:15		09:25		16:26		16:43	
%Solids :			57.4		53.3		62.9		74.9		85.9		74.1	
Dilution Factor :			1.0		1.0		1.0		1.0		1.0		1.0	
Field QC :			Dup. Collected		Dup of MC0054		Dup. Collected		Dup of MC0051					
ANALYTE	**CRDL**	**RBC**	**Result**	**Flag**	**Result**	**Flag**	**Result**	**Flag**	**Result**	**Flag**	**Result**	**Flag**	**Result**	**Flag**
ALUMINUM	40	7,800 N	4,180		3,820		5,090		3,500		6,670		5,240	
ANTIMONY	12	3.1 N							[2.1]	B			[2.4]	B
ARSENIC	2	0.43 C	10.2	B	13.5		12.2		9.2		25.2		21.9	
BARIUM	40	550 N	251		165		179		121		222		471	
BERYLLIUM	1	16 N	[0.61]		[1.0]		[0.90]		[0.51]		1.5		[1.2]	
CADMIUM	1	3.9 N									3.2		[0.27]	
CALCIUM	1000	NTX	4,600		8,560		2,580		1,600		1,790		1,990	
CHROMIUM	2	12,000 N	9.1		7.0	K	20.4		12.7		21.1		16.6	
COBALT	10	470 N	[9.0]		[9.7]		[10.8]		[9.1]		30.4		19.7	
COPPER	5	310 N	32.5		43.0		34.4		25.2		72.3		59.0	
IRON	20	2,300 N	16,200		17,000		38,400		20,000		55,200		38,300	
LEAD	0.6	400 (action level)	28.1		32.7		67.7		48.6		33.3		29.6	
MAGNESIUM	1000	NTX	[682]		[1,010]		[454]		[363]		[684]		[543]	
MANGANESE	3	160 N	494		766		1,370		1,030		777		595	
MERCURY	0.1	2.3 N		R	[0.10]	B	0.33					R		R
NICKEL	8	160 N	21.7		28.1		18.9		12.6		124		76.1	
POTASSIUM	1000	NTX	[583]	J	[607]	J	[554]	J	[390]	J	[814]	J	[815]	J
SELENIUM	1	39 N		UL				UL	[1.1]	L		UL	[1.1]	K
SILVER	2	39 N					[0.78]				[0.88]		[0.84]	
SODIUM	1000	NTX	[180]		[238]		[133]	J	[99.4]	J	[104]		[112]	
THALLIUM	2	0.55 N							4.2	K				
VANADIUM	10	55 N	[15.1]		[11.1]		24.1		15.9		39.1		37.0	
ZINC	4	2,300 N	112		272		191		130		403		310	
CYANIDE	0.5	160 N	[0.53]	L		UL		UL		UL	[0.24]	L		UL

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Table 4 (Page 7 of 8)
Summary of Inorganic Analyte Detections
Current Sediment Samples
(mg/Kg)

Case:			28200		28200		28200		28200		28200		28200	
Sample Number :			72506		72507		72508		72509		72510		72511	
Sampling Location :			KSL-SD-50-03-700		KSL-SD-51-03-700		KSL-SD-52-03-700		KSL-SD-58-03-700		KSL-SD-53-03-700		KSL-SD54-030700	
Matrix :			Soil		Soil		Soil		Soil		Soil		Soil	
Units :			mg/Kg		mg/Kg		mg/Kg		mg/Kg		mg/Kg		mg/Kg	
Date Sampled :			7/21/2000		7/21/2000		7/21/2000		7/21/2000		7/21/2000		7/21/2000	
Time Sampled :			14:21		13:49		12:13		12:33		11:58		10:42	
%Solids :														
Dilution Factor :														
Field QC :							Dup. Collected		Dup. of 72508					
ANALYTE	**CRDL**	**RBC**	**Result**	**Flag**	**Result**	**Flag**	**Result**	**Flag**	**Result**	**Flag**	**Result**	**Flag**	**Result**	**Flag**
ALUMINUM	40	7,800 N	5,560		285		5,500		5,800		8,880		6,040	
ANTIMONY	12	3.1 N	1	U	1	U	1	U	1	U	1	U	1	U
ARSENIC	2	0.43 C	27.8		34		17.9		16.2		15.4		9.3	
BARIUM	40	550 N	217		3380		265		278		416		151	
BERYLLIUM	1	16 N	0.7		0.5	U	0.8		0.8		1		1	
CADMIUM	1	3.9 N	0.6		0.5	U	1.4		2.2		1.9		1.2	
CALCIUM	1000	NTX	5,710		73,100		4,530		4,510		4,320		5,860	
CHROMIUM	2	12,000 N	10		10	U	17		12		13		12	
COBALT	10	470 N	6		18		11		12		14		17	
COPPER	5	310 N	19.8		7.2		35.1		35.7		62.0		29.1	
IRON	20	2,300 N	36,700		284,000		22,700		24,300		29,000		26,700	
LEAD	0.6	400 (action level)	47		17		43		41		46		43	
MAGNESIUM	1000	NTX	676		1350		821		859		1120		1370	
MANGANESE	3	160 N	182		1220		969		911		438		984	
MERCURY	0.1	2.3 N	1	U	0.1	U	0.1		0.2		0.1		0.1	U
NICKEL	8	160 N	6		4	U	20		21		34		39	
POTASSIUM	1000	NTX	941		791		776		780		1120		710	
SELENIUM	1	39 N	1.6		1.1		1.4		1.5		1.8		0.9	
SILVER	2	39 N	1	U	10	U	1	U	1	U	1	U	1	U
SODIUM	1000	NTX	540		1810		100	U	100	U	100	U	100	U
THALLIUM	2	0.55 N	1	U	1	U	1	U	1	U	1	U	1	U
VANADIUM	10	55 N	22.0		50.0	U	27.0		29.0		33.0		19.0	
ZINC	4	2,300 N	126		56		157		161		205		214	
CYANIDE	0.5	160 N	1	U	1	U	1	U	1	U	1	U	1	U

Notes:

Flag = see Qualifier Code Glossaries

CRDL = Contract Required Detection Limit

NTX = No Toxicity Information

RBC = USEPA Region III Risk-Based Concentration
for Residential soil, RBC table dated 10/05/00.

Table 4 (Page 8 of 8)
Summary of Inorganic Analyte Detections
Current Sediment Samples
(mg/Kg)

Case:			28200		28200		28200	
Sample Number :			72512		72513		72514	
Sampling Location :			KSL-SD-55-03-700		KSL-SD-56-03-700		KSL-SD-57-03-700	
Matrix :			Soil		Soil		Soil	
Units :			mg/Kg		mg/Kg		mg/Kg	
Date Sampled :			7/21/2000		7/21/2000		7/21/2000	
Time Sampled :			8:54		9:14		9:34	
%Solids :								
Dilution Factor :								
Field QC :								
ANALYTE	**CRDL**	**RBC**	**Result**	**Flag**	**Result**	**Flag**	**Result**	**Flag**
ALUMINUM	40	7,800 N	6,410		7,150		6,470	
ANTIMONY	12	3.1 N	1	U	1	U	1	U
ARSENIC	2	0.43 C	12.9		8		16.2	
BARIUM	40	550 N	174		205		354	
BERYLLIUM	1	16 N	1.2		0.8		1.2	
CADMIUM	1	3.9 N	1.2		1.8		2.6	
CALCIUM	1000	NTX	4,020		3,990		8,250	
CHROMIUM	2	12,000 N	15		16		10	
COBALT	10	470 N	15		10		14	
COPPER	5	310 N	33.1		34.8		35.8	
IRON	20	2,300 N	30,700		25,100		25,000	
LEAD	0.6	400 (action level)	39		37		55	
MAGNESIUM	1000	NTX	1060		1760		979	
MANGANESE	3	160 N	685		597		420	
MERCURY	0.1	2.3 N	0.1		0.1	U	0.1	
NICKEL	8	160 N	40		45		47	
POTASSIUM	1000	NTX	778		981		692	
SELENIUM	1	39 N	1.1		1.6		1.7	
SILVER	2	39 N	1	U	1	U	1	U
SODIUM	1000	NTX	100	U	100	U	100	U
THALLIUM	2	0.55 N	1		1	U	1	U
VANADIUM	10	55 N	24.0		23.0		23.0	
ZINC	4	2,300 N	244		214		289	
CYANIDE	0.5	160 N	1	U	1	U	1	U

Notes:

Flag = see Qualifier Code Glossaries

CRDL = Contract Required Detection Limit

NTX = No Toxicity Information

RBC = USEPA Region III Risk-Based Concentration
for Residential soil, RBC table dated 10/05/00.

Table 5 (2 pages)
Summary of Inorganic Analytes - Historical Sediment
Sample date: July 1997
mg/Kg

FIELD SAMPLE NUMBER		SD-01		SD-02	SD-03	SD-04	SD-05	SD-06	SD-07	SD-08
LABORATORY SAMPLE NUMBER		97072530		97072531	97072532	97072533	97072534	97072535	97072536	97072537
PERCENT SOLIDS (60C)		53.1		74.8	82.2	36.0	48.8	54.4	43.9	62.9
NQL FACTOR		1		1	1	1	1	1	1	1
HAZARDOUS SUBSTANCE					Background					
Inorganics	NQL									
Aluminum	20	4,320		6,650	6,090	6,400	7,210	9,690	6,480	9,160
Antimony	0.3	0.3	</=	---	0.4	---	0.5	---	0.6	---
Arsenic	0.5	4.6		6.6	10.8	12.8	4.8	6.4	7.5	9.9
Barium	10	127		141	99.0	682	467	448	178	318
Beryllium	0.3	0.7		1.7	1.2	0.6	0.8	1.0	0.9	0.9
Cadmium	0.5	0.7		0.9	0.8	2.2	1.8	2.0	1.6	0.7
Calcium	50	29,600		5,650	4,210	30,000	4,640	6,780	4,520	3,770
Chromium	1	10.8		14.0	17.9	9.5	12.2	13.2	11.8	15.2
Cobalt	0.4	9.7		19.8	19.0	13.8	14.0	14.7	13.1	28.1
Copper	0.2	19.2		24.5	23.2	42.5	46.1	44.5	27.9	55.1
Iron	10	20,700		43,400	39,400	33,400	21,500	21,000	20,700	33,400
Lead	2	26.0		29.3	21.3	28.0	51.9	48.8	44.4	52.4
Magnesium	50	2,220	J	1,390	1,880	1,110	1,700	1,800	1,290	1,580
Manganese	1.5	777		702	738	1,820	330	461	606	986
Mercury	0.1	---		---	---	---	0.1	0.1	0.3	---
Nickel	4	26.6		76.7	60.4	29.6	52.9	61.8	30.4	36.7
Potassium	100	523		964	674	1,180	1,330	1,950	687	1,770
Selenium	0.3	0.4		---	0.5	1.3	1.9	3.0	1.5	0.6
Silver	1.0	---		---	---	---	---	---	---	---
Sodium	100	135		160	---	328	112	154	101	194
Thallium	0.2	---		---	---	0.8	0.5	0.5	0.3	0.4
Vanadium	5	21.4		23.3	27.5	26.5	24.4	26.3	20.3	30.8
Zinc	2	138		378	254	296	240	270	173	211
Cyanide	1.0	---		---	---	---	---	---	---	---

Notes:
mg/Kg - milligrams per Kilogram
NQL - Nominal Quantitation Limit
</= - Reported value is estimated.
--- - Not Detected
J - Analyte present. Reported value is estimated.

Sample quantitation limit = NQL * NQL FACTOR

Source:
Table 2, Weston Site Inspection Report dated August 31, 1998

Table 5 (2 pages)
Summary of Inorganic Analytes - Historical Sediment
Sample date: July 1997
mg/Kg

FIELD SAMPLE NUMBER		SD-09	SD-10	SD-11	SD-12	SD-13	SD-14	SD-15
LABORATORY SAMPLE NUMBER		97072538	97072539	97072540	97072541	97072542	97072543	97072544
PERCENT SOLIDS (60C)		66.5	39.0	76.0	73.3	58.7	65.1	28.9
NQL FACTOR		1	1	1	1	1	1	1
		Background						Duplicate of SD-04
HAZARDOUS SUBSTANCE								
Inorganics	NQL							
Aluminum	20	11,400	4,500	5,080	3,820	7,000	4,850	5,650
Antimony	0.3	0.5	0.4	0.3	1.7	---	---	---
Arsenic	0.5	9.3	11.1	9.5	14.9	23.7	3.6	11.7
Barium	10	265	260	136	922	623	110	891
Beryllium	0.3	2.6	0.8	1.1	0.6	0.9	0.8	0.6
Cadmium	0.5	0.6	0.5	---	---	3.1	0.5	4.0
Calcium	50	30,200	8,050	5,150	1,620	8,880	2,090	49,000
Chromium	1	13.7	24.4	17.7	16.2	15.8	10.9	9.2
Cobalt	0.4	10.0	12.0	7.6	17.8	17.5	9.8	16.1
Copper	0.2	86.4	24.7	31.9	76.3	66.8	20.1	41.3
Iron	10	31,900	30,300	47,000	29,500	57,300	23,100	38,700
Lead	2	79.8	44.5	19.4	38.3	31.2	22.8	28.7
Magnesium	50	2,540	707	466	584	1,350	892	1,420
Manganese	1.5	566	686	313	199	873	274	2,910
Mercury	0.1	---	0.4	---	---	---	---	---
Nickel	4	23.7	12.1	14.4	38.0	57.7	33.7	31.8
Potassium	100	1,220	628	778	1,040	1,280	568	1,070
Selenium	0.3	1.0	1.2	0.7	3.5	1.3	---	1.3
Silver	1.0	---	---	---	---	<2.0	---	---
Sodium	100	134	451	---	---	229	116	343
Thallium	0.2	0.4	0.4	---	1.4	0.5	---	0.8
Vanadium	5	25.9	32.8	37.2	46.8	38.8	16.4	22.0
Zinc	2	359	242	152	103	381	183	381
Cyanide	1.0	---	---	---	---	---	---	---

Notes:
mg/Kg - milligrams per Kilogram
NQL - Nominal Quantitation Limit
--- - Not Detected

Sample quantitation limit = NQL * NQL FACTOR

Source:
Table 2, Weston Site Inspection Report
dated August 31, 1998

Table 6 (Page 1 of 1)
Summary of Concrete Leachate Well (LW01-LW02) Analytical Results
Frequency and Range Detected
May 2001

Compound/Analyte	RBC	Frequency	Range	Frequency	Range
Volatile Organic Compounds					
			ug/L		
1,4-Dichlorobenzene	0.47 C	2/2	4 J - 4 J		na
Chloroethane	3.6 C	2/2	3 J - 4 J		na
Ethylbenzene	130 N	1/2	2 J - 2 J		na
Isopropylbenzene	43 N	2/2	5 J - 5 J		na
Xylenes (total)	1200 N	2/2	3 J - 9 J		na
Semivolatile Organic Compounds					
			ug/L		
Naphthalene	0.65 N	2/2	2 J - 2 J		na
N-Nitrosodiphenylamin	14 C	2/2	31 - 34		na
Inorganic Analytes			***Dissolved Metals***		***Total Metals***
			ug/L		ug/L
ALUMINUM	3,700 N	0/0	na	0/0	na
ANTIMONY	1.5 N	0/2	na	0/2	na
ARSENIC	0.045 C	1/1	3 []L - 3 []L	0/0	na
BARIUM	260 N	2/2	2990 - 3080	2/2	2440 - 3630
BERYLLIUM	7.3 N	0/2	na	0/2	na
CADMIUM	1.8 N	0/2	na	0/2	na
CALCIUM	NTX	2/2	1E+05 - 1E+05	2/2	2E+05 - 153000
CHROMIUM	5500 N	0/0	na	1/2	1.1 [] - 1.1 []
COBALT	220 N	2/2	7.2 [] - 13.6 []	2/2	8.1 [] - 13.8 []
COPPER	150 N	0/0	na	0/0	na
IRON	1,100 N	2/2	7780 - 18200	2/2	22000 - 25200
LEAD	15 (action level)	0/2	na	0/2	na
MAGNESIUM	NTX	2/2	37400 - 39200	2/2	39400 - 39800
MANGANESE	73 N	2/2	868 - 1310	2/2	907 - 1320
MERCURY	1.1 N	2/2	0.22 L - 1.1	1/2	0.44 - 0.44
NICKEL	73 N	2/2	26.3 [] - 37 []	1/1	40.3 - 40.3
POTASSIUM	NTX	2/2	82100 +J - 87500 +	2/2	92500 + - 93000 +
SELENIUM	18 N	0/2	na	0/2	na
SILVER	18 N	0/2	na	0/2	na
SODIUM	NTX	2/2	3E+05 - 3E+05	2/2	3E+05 - 306000
THALLIUM	0.26 N	0/2	na	0/2	na
VANADIUM	26 N	0/2	na	0/2	na
ZINC	1,100 N	0/0	na	0/0	na
CYANIDE	73 N	0/2	na	0/2	na

= Contaminants of potential concern (based on human risk assessment selection criteria)
Note : Letter and symbol codes are defined in the organic and inorganic data qualifier code glossaries (see report appendix).
1/16 = Number of detections/Number of usable results
NTX = No Toxicity Information
na = Not Applicable
RBC = USEPA Region III Risk-Based Concentration for tap water, RBC table dated 10/05/00.
Two (2) concrete leachate well samples were collected.

Table 7 (Page 1 of 1)
Summary of Leachate Seep Analytical Results
Frequency and Range Detected
May 2001

Compound/Analyte	RBC	Frequency	Range		
Volatile Organic Compounds					
				ug/L	
1,1-Dichloroethane	800 N	1/4	0.3 J	-	0.3 J
1,2-Dichlorobenzene	550 N	1/4	0.4 J	-	0.4 J
1,4-Dichlorobenzene	4.7 C	2/4	2 J	-	2
Chloroethane	36 C	2/4	2 J	-	3 J
Dichlorodifluoromethane	350 N	1/4	2	-	2
Ethylbenzene	1300 N	1/4	0.4 J	-	0.4 J
Isopropylbenzene	430 N	2/4	2 J	-	3
Methyl tert-Butyl Ether	6300 N	1/4	0.9	-	0.9
Xylenes (total)	12000 N	1/4	3	-	3
Semivolatile Organic Compounds					
				ug/L	
Caprolactam	18000 N	2/4	5 J	-	6 J
Naphthalene	6.5 N	2/4	1 J	-	2 J
N-Nitrosodiphenylamine	140 C	2/4	6 J	-	9 J
Pesticides and PCBs					
Heptachlor epoxide	0.074 C	1/4	0.056 J	-	0.056 J
Inorganic Analytes					
				ug/L	
ALUMINUM	37000 N	2/2	510	-	13600
ANTIMONY	15 N	0/4		na	
ARSENIC	0.45 C	2/3	20.1	-	31.6
BARIUM	2600 N	4/4	173 []	-	3340
BERYLLIUM	73 N	1/4	3.1 []L	-	3.1 []L
CADMIUM	18 N	1/3	4.5 []	-	4.5 []
CALCIUM	NTX	4/4	61200	-	113000
CHROMIUM	55000 N	3/4	5.1 []	-	18.5 L
COBALT	2200 N	4/4	1.6 []	-	53.7
COPPER	1500 N	1/1	86.9	-	86.9
IRON	11000 N	4/4	362	-	71200
LEAD	15 (action level)	1/4	149	-	149
MAGNESIUM	NTX	4/4	6190	-	43800
MANGANESE	730 N	4/4	462	-	2310
MERCURY	11 N	0/4		na	
NICKEL	730 N	2/2	33.2	-	42.7
POTASSIUM	NTX	4/4	5250 J	-	147000 +J
SELENIUM	180 N	0/2		na	
SILVER	180 N	1/4	1.6 []L	-	1.6 []L
SODIUM	NTX	4/4	13700	-	480000
THALLIUM	2.6 N	3/3	4.6 []	-	6.4 []
VANADIUM	260 N	1/4	53.7 L	-	53.7 L
ZINC	11000 N	1/1	1270	-	1270
CYANIDE	730 N	0/4		na	

= Contaminants of potential concern (based on human risk assessment selection criteria)

Note : Letter and symbol codes are defined in the organic and inorganic data qualifier code glossaries (see report appendix).

1/16 = Number of detections/Number of usable results

NTX = No Toxicity Information

na = Not Applicable

RBC = USEPA Region III Risk-Based Concentration for tap water, RBC table dated 10/05/00.

Table 8 (Page 1 of 1)
Summary of Supplemental Water Quality Parameter Results
Leachate Seeps
May 2001

Case Number:		R3949		R3949		R3949		R3949	
Sample ID for REQ01110:		1051702		1051728		1051705		1051706	
Sample ID for REQ01109:		1051713		1051740		1051716		1051717	
Station Location :		KSL-LS01-501		KSL-LS03-501		KSL-LS04-501		KSL-LS05-501	
Field QC									
Matrix :		Water		Water		Water		Water	
Units :		mg/l		mg/l		mg/l		mg/l	
Date Sampled :		5/15/2001		5/16/2001		5/15/2001		5/15/2001	
Time Sampled :		8:00		7:20		8:50		8:20	
Dilution Factor :									
ANALYTE	QL	Result	Flag	Result	Flag	Result	Flag	Result	Flag
Total Organic Carbon (TOC)	1.0	66.8		6.3		47		80	
Chloride	0.25	91.7		66		26.5		108	
Biochemical Oxygen Demand (BOD)	2.0	34.2		5.8		8.6		16.2	
Chemical Oxygen Demand (COD)	10	212		36		54		220	
Ammonia	0.04	140		0.235		0.592		115	
Nitrate	0.15	0.747	C	2.82		0.217	C	<0.15	C
Nitrite	0.05	<2.5	C	<0.05		<0.05	C	<2.5	C
Oil & Grease	5.0	<5		<5		<20.0		<5	
Total Phosphorus	0.010	4.09		0.12		10.4		0.298	
Total Dissolved Solids (TDS)	10	1400		450		194		1410	
Total Suspended Solids (TSS)	4	214		44		4920		84	
Sulfide	0.01	0.01		<0.01		0.03		0.02	
Bromide	0.50	5.03		<0.50		<0.50		5.24	
Fluoride	0.10	<0.10		<0.10		0.161		<0.10	
Sulfate	0.5	5.64		42.7		26		4.97	
Phosphate	0.25	<0.25	C	<0.25		<0.25	C	<0.25	C

Notes:

Analytes for Laboratory Request REQ01059 include: ammonia, BOD, COD, bromide, chloride, fluoride, nitrate, nitrite, phosphate, sulfate, oil and grease, sulfide, total organic carbon, and total phosphorus

Analytes for Laboratory Request REQ01057 include TDS and TSS.

Flag = see Qualifier Code Glossaries

QL = Quantitation Limit

Table 9 (Page 1 of 1)
Summary of Leachate Wells (LW03-LW08) Analytical Results
Frequency and Range Detected
May 2001

Compound/Analyte	RBC	Frequency	Range	Frequency	Range
Volatile Organic Compounds			ug/L		
Chloroethane	3.6 C	1/9	2 J - 2 J		na
1,4-Dichlorobenzene	0.47 C	1/9	1 J - 1 J		na
Semivolatile Organic Compounds					
N-Nitrosodiphenylamine	14 C	1/9	5 J - 5 J		na
Inorganic Analytes			***Dissolved Metals*** ug/L		***Total Metals*** ug/L
ALUMINUM	3,700 N	0/4	na	3/8	763 - 184000
ANTIMONY	1.5 N	0/9	na	1/9	18.8 □ - 18.8 □
ARSENIC	0.045 C	4/9	2.8 □L - 36	2/6	30.3 - 230
BARIUM	260 N	9/9	10.5 □ - 1850	9/9	11.9 □ - 5300
BERYLLIUM	7.3 N	1/9	0.1 □L - 0.1 □L	1/9	16.8 - 16.8
CADMIUM	1.8 N	0/9	na	1/9	28.8 28.8
CALCIUM	NTX	9/9	15100 - 255000	9/9	15100 - 253000
CHROMIUM	5500 N	1/7	1.4 □ - 1.4 □	4/9	1 □ - 346
COBALT	220 N	2/9	15.3 □ - 77.1	4/9	2.2 □ - 247
COPPER	150 N	0/1	na	1/3	918 - 918
IRON	1,100 N	9/9	704 - 114000	9/9	575 - 496000
LEAD	15 (action level)	0/9	na	1/9	757 - 757
MAGNESIUM	NTX	9/9	3000 □ - 29700	9/9	3190 □ - 43500
MANGANESE	73 N	9/9	190 - 13200	9/9	168 - 19700
MERCURY	1.1 N	1/9	0.43 - 0.43	3/9	0.25 K - 3.3
NICKEL	73 N	4/9	3 □ - 298	2/5	302 - 369
POTASSIUM	NTX	9/9	148 □ - 11200 J	8/9	123 □J - 25800
SELENIUM	18 N	1/9	3.4 □ - 3.4 □	0/9	na
SILVER	18 N	1/9	4.5 □L - 4.5 □L	1/9	2.7 □L 2.7 □L
SODIUM	NTX	9/9	2250 □ - 51300	9/9	2370 □ - 39000 J
THALLIUM	0.26 N	3/9	4.1 □K - 5.3 □K	0/9	na
VANADIUM	26 N	0/6	na	1/7	434 - 434
ZINC	1,100 N	1/1	499 - 499	2/2	511 - 2660
CYANIDE	73 N	0/0	na	0/9	na

= Contaminants of potential concern (based on human risk assessment selection criteria)

Note : Letter and symbol codes are defined in the organic and inorganic data qualifier code glossaries (see report appendix).

1/16 = Number of detections/Number of usable results

NTX = No Toxicity Information

na = Not Applicable

RBC = USEPA Region III Risk-Based Concentration for tap water, RBC table dated 10/05/00.

Table 10 (Page 1 of 1)
Summary of Supplemental Water Quality Parameter Results
Leachate Wells LW03S-LW08D
May 2001

Case Number:		R3949		R3949		R3949		R3949		R3949		R3949		R3949		R3949		R3949	
Sample ID for REQ01110:		1051730		1051731		1051704		1051508		1051738		1051506		1051501		1051502		1051504	
Sample ID for REQ01109:		1051742		1051743		1051715		1051512		1051750		1051517		1051510		1051511		1051515	
Station Location : (pre-fix KSL-)		LW03S-501		LW03D-501		LW04-501		LW05-501		LW06D-501		LW07-501		LW08S-501		LW10-501		LW08D-501	
Field QC														Dup. Collected		Dup. of LW08S			
Matrix :		Water		Water		Water		Water		Water		Water		Water		Water		Water	
Units :		mg/l		mg/l		mg/l		mg/l		mg/l		mg/l		mg/l		mg/l		mg/l	
Date Sampled :		5/16/2001		5/16/2001		5/15/2001		5/14/2001		5/16/2001		5/14/2001		5/14/2001		5/14/2001		5/14/2001	
Time Sampled :		7:30		8:10		13:02		12:06		11:04		12:55		8:03		7:40		10:13	
Dilution Factor :																			
ANALYTE	QL	Result	Flag	Result	Flag	Result	Flag	Result	Flag	Result	Flag	Result	Flag	Result	Flag	Result	Flag	Result	Flag
Total Organic Carbon (TOC)	1.0	17.2		1.1		2.4		<1.0		<1.0		<1.0		<1.0		<1.0		<1.0	
Chloride	0.25	58.9		1.2		25.6		11		1.32		0.6		3.64		3.62		0.564	
Biochemical Oxygen Demand (BOD)	2.0	17.4		<2.0		<2.0		<2.0	C	8.5		<2.0	C	<2.0	C	<2.0	D C	<2.0	C
Chemical Oxygen Demand (COD)	10	186		<10		<10		<10		<10		<10		<10		<10		<10	
Ammonia	0.04	8.48		0.421		0.194		0.126		0.326		0.061		0.065		0.064		0.093	
Nitrate	0.15	<0.15		<0.15		<0.15		<0.15		<0.15		<0.15		<0.15		<0.15		<0.15	
Nitrite	0.05	<0.05		<0.05		<0.05		<0.05		<0.05		<0.05		<0.05		<0.05		<0.05	
Oil & Grease	5.0	<25	C	<5		<5		<5		<5		<5		<5		<5		<5	
Total Phosphorus	0.010	22.1		0.315		0.02		<0.010		0.081		0.043		0.052		0.045		0.025	
Total Dissolved Solids (TDS)	10	604		235		484		922		241		74		<=14		51		66	
Total Suspended Solids (TSS)	4	22700		12		4		24		<4		20		60		71		<4	
Sulfide	0.01	<0.01		0.03		<0.01		<0.01		<0.01		0.03		0.03		<0.01		<0.01	
Bromide	0.50	<0.50		<0.50		<0.50		<0.50		<0.50		<0.50		<0.50		<0.50		<0.50	
Fluoride	0.10	0.247		<0.10		<0.10		<0.10		<0.10		<0.10		<0.10		<0.10		<0.10	
Sulfate	0.5	63.6		23.6		52.5		461		29.4		10.7		11.2		11.2		10.6	
Phosphate	0.25	<0.25		<0.25		<0.25		<0.25		<0.25		<0.25		<0.25		<0.25		<0.25	

Notes:

Analytes for Laboratory Request REQ01059 include:
Ammonia, BOD, COD, inorganic anions, TOC,
oil and grease, sulfide, and total phosphorus

Analytes for Laboratory Request REQ01057 include:
TDS and TSS

Flag = see Qualifier Code Glossaries

QL = Quantitation Limit

Table 11 Kim Stan Landfill Detections Exceeding Federal MCLs					
Compound or Analyte	MCL (ug/l)	MCLG (ug/l)	Locations exceeding the MCL	Maximum Concentration Detected	Detection Exceeded MCL by:
Arsenic	10	0	LW03D	61.6	51.6 ugL
			MW07	75.0	65 ug/L
Barium	2000	2000	LW01, LW02	3080	1080 ug/L
			LW03S	2230	230 ug/L
Thallium	2	0.5	LW01, LW02	17.0 J	15 ug/L
			LW03D, LW04, LW05, LW07, LW08S	18.2 J	16.2 ug/L
			MW02, MW05, MW06, MW07, MW10D, MW11S, MW11D, MW15, MW16	16.0 L	14 ug/L
Vinyl Chloride	2	0	MW06	4 J	2 ug/L

LW01 and LW02: Out of service concrete leachate collection wells
LW03 to LW08: Leachate monitoring wells. (LW03, LW06, and LW08 are cluster well locations)
MW01 to MW07: Off-site monitoring wells

Table 12
Summary of Potable Analytical Results
Frequency and Range Detected
May 2001

Compound/Analyte	RBC	Frequency	Range		
Volatile Organic Compounds					
				ug/L	
Acetone	11 N	1/6	22 J	-	22 J
Inorganic Analytes					
				ug/L	
ALUMINUM	3,700 N	0/4		na	
ANTIMONY	1.5 N	0/5		na	
ARSENIC	0.045 C	0/4		na	
BARIUM	260 N	5/5	139 []	-	1110 []
BERYLLIUM	7.3 N	0/4		na	
CADMIUM	1.8 N	1/3	12.9	-	12.9
CALCIUM	NTX	3/3	844 []	-	92500
CHROMIUM	5500 N	0/6		na	
COBALT	220 N	3/6	1.5 []	-	1.8 []
COPPER	150 N	1/1	30.8	-	30.8
IRON	1,100 N	4/5	1840	-	7700
LEAD	15 (action level)	1/6	23.6	-	23.6
MAGNESIUM	NTX	6/6	152 []	-	8300
MANGANESE	73 N	5/5	11.5 []	-	436
MERCURY	1.1 N	1/6	0.96	-	0.96
NICKEL	73 N	0/2		na	
POTASSIUM	NTX	6/6	245 []	-	1310 []
SELENIUM	18 N	0/6		na	
SILVER	18 N	1/6	1.9 []	-	1.9 []
SODIUM	NTX	6/6	1950 []J	-	125000 J
THALLIUM	0.26 N	1/6	5.2 []K	-	5.2 []K
VANADIUM	26 N	0/6		na	
ZINC	1,100 N	2/2	346	-	575
CYANIDE	73 N	0/5		na	

= Contaminants of potential concern (based on human risk assessment selection criteria)

Note : Letter and symbol codes are defined in the organic and inorganic data qualifier code glossaries (see report appendix).

1/16 = Number of detections/Number of usable results

NT = No Toxicity Information

na = Not Applicable

RBC = USEPA Region III Risk-Based Concentration for tap water, RBC table dated 10/05/00.

Table 13
Summary of Chemicals of Concern and
Medium-Specific Exposure Point Concentrations

Scenario Timeframe: Future
Medium: Ground Water
Exposure Medium: Ground Water

Exposure Point	Chemical of Concern	Concentration Detected		Units	Frequency of Detection	Exposure Point Concentration	Exposure Point Concentration Units	Statistical Measure
		Min	Max					
Tap Water - Drinking/Bathing	vinyl chloride	1 J	4 J	ug/l	5/40	2	ug/l	95% UCL
	arsenic	16.3	75	ug/l	5/14	75	ug/l	MAX
	iron	495	104000	ug/l	46/46	21022	ug/l	95% UCL
	manganese	134	33200	ug/l	48/48	3057	ug/l	95% UCL
	thallium	3.1	18.2	ug/l	18/48	6.2	ug/l	95% UCL

Key

ug/l: micrograms per liter (parts per billion)
95% UCL: 95% Upper Confidence Limit
MAX: Maximum Concentration

Summary of Chemicals of Concern and Medium-Specific Exposure Point Concentrations

The table presents the chemicals of concern (COCs) and exposure point concentration for each of the COCs detected in the ground water (i.e., the concentration that will be used to estimate the exposure and risk from each COC in the ground water). The table includes the range of concentratinos detected for each COC, as well as the frequency of detection (i.e., the number of times the chemical was detected in the samples collected at the site), the exposure point concentration (EPC), and how the EPC was derived.

TABLE 14
SELECTION OF EXPOSURE PATHWAYS
KIM STAN LANDFILL

Scenario Timeframe	Medium	Exposure Medium	Exposure Point	Receptor Population	Receptor Age	Exposure Route	On-Site/ Off-Site	Type of Analysis	Rationale for Selection or Exclusion of Exposure Pathway
Future	Groundwater	Groundwater	Tap Water/Drinking	Resident	Adult	Ingestion	On-site	Quant	Residents may be exposed to migrating groundwater
					Child				
				Industrial/Commercial Wrkr	Adult		Off-Site	Quant	Workers in nearby business may be exposed to migrating groundwater
Future	Groundwater	Groundwater	Tap Water/Bathing	Resident	Adult	Dermal/ Inhalation	On-Site	Quant	Residents may be exposed to migrating groundwater
					Child				
				Industrial/Commercial Wrkr	Adult		Off-Site	Quant	Workers in nearby business may be exposed to migrating groundwater
Current Future	Surface Water	Surface Water	Surface Water/Outdoor Activities	Resident	Adult	Dermal Ingestion	Off-Site	Quant	Residents may be exposed to surface water during outdoor activities in the off-site assessment area
					Child				
				Industrial/Commercial Wrkr	Adult			Quant	Workers may be exposed to surface water during outdoor activities in the off-site assessment area
				Trespassser	Adolescent			Quant	Trepasser may be exposed to surface water while in the assessment area
Current Future	Sediment	Flood Plain Sediments	Sediments/Outdoor Activities	Resident	Adult	Dermal Ingestion	Off-Site	Quant	Residents may be exposed to sediments during outdoor activities in the off-site assessment area.
					Child				
				Industrial/Commercial Wrkr	Adult			Quant	Workers may be exposed to sediments during outdoor activities in the off-site assessment area
				Trespassser	Adolescent			Quant	Trepasser may be exposed to sediment while in the assessment area.
Current Future	Sediment	Channel Sediments	Sediments/Outdoor Activities	Resident	Adult	Dermal Ingestion	Off-Site	Quant	Residents may be exposed to sediments during outdoor activities in the off-site assessment area
					Child				
				Industrial/Commercial Wrkr	Adult			Quant	Workers may be exposed to sediments during outdoor activities in the off-site assessment area
				Trespassser	Adolescent			Quant	Trepasser may be exposed to sediment while in the assessment area.
Current Future	Surface Water	Leachate Seeps	Outdoor Activities/Leachate Seeps	Resident	Adult	Dermal Ingestion	On-Site	Quant	Residents may be exposed to leachate during outdoor activities in the off-site assessment area
					Child				
				Industrial/Commercial Wrkr	Adult		Off-Site	Quant	Workers may be exposed to leachate during outdoor activities in the off-site assessment area.
				Trespassser	*Adolescent*			Quant	Trepasser may be exposed to leachate while in the assessment area
Current	Surface Soil	Soil	Outdoor Activities	Resident	Adult	Ingestion Dermal	On-Site	Qual	All COPC evaluated with background study All of the chemicals exist on-site at the same level as background. Appenix B contains Background
					Child				
				Industrial/Commercial Wrkr	Adult				
				Trespassser	Adolescent				
Current	Subsurface Soil	Soil	Outdoor Activities	Resident	Adult	Ingestion Dermal	On-Site	Qual	All COPC evaluated with background study. All of the chemicals exist on-site at the same level as background Appenix B contains Background Study
					Child				
				Industrial/Commercial Wrkr	Adult				
				Trespassser	Adolescent				

TABLE 15.1

VALUES USED FOR DAILY INTAKE CALCULATIONS

KIM-STAN LANDFILL

Scenario Timeframe: Future
Medium: Groundwater
Exposure Medium: Groundwater
Exposure Point: Tap Water
Receptor Population: Resident
Receptor Age: Adult

Exposure Route	Parameter Code	Parameter Definition	Units	RME Value	RME Rationale/ Reference	CT Value	CT Rationale/ Reference	*Intake Equation/ Model Name*
Ingestion	CW	Chemical Concentration in Groundwater	mg/L	See Table 3	See Table 3			Chronic Daily Intake (CDI) (mg/kg-day) =
	IR-W	Ingestion Rate of Water	L/day	2	EPA, 1997a			CS x IR x EF x ED x 1/BW x 1/AT
	EF	Exposure Frequency	days/year	350	EPA, 1991			Daily Intake Rate
	ED	Exposure Duration	years	24	EPA, 1991			
	BW	Body Weight	kg	70	EPA, 1991			
	AT-C	Averaging Time (Cancer)	days	25,550	EPA, 1989a			
	AT-N	Averaging Time (Non-Cancer)	days	8760	EPA, 1989a			

Sources:

EPA, 1997a: Exposure Factors Handbook

EPA, 1991: Standard Default Exposure Factors

EPA, 1989a: RAGS Part A

EPA 1996a: Supplemental Guidance to RAGS: Region 4 Bulletins

TABLE 15.2

VALUES USED FOR DAILY INTAKE CALCULATIONS

KIM-STAN LANDFILL

Scenario Timeframe: Future
Medium: Groundwater
Exposure Medium: Groundwater
Exposure Point: Showerhead
Receptor Population: Resident
Receptor Age: Adult

Exposure Route	Parameter Code	Parameter Definition	Units	RME Value	RME Rationale/ Reference	CT Value	CT Rationale/ Reference	Intake Equation/ Model Name
Dermal	DAevent	Absorbed Dose Per Event	mg/cm^2-event	See Text	See Text			CDI (mg/kg day)= DAevent x EF x ED x EV x SA x 1/BW x 1/AT
	EF	Exposure Frequency	days/year	350	EPA, 1991			
	ED	Exposure Duration	years	24	EPA, 1991			
	EV	Event Frequency	events/day	1	EPA, 1992			
	SA	Skin Surface Area	cm^2	20,000	EPA, 1997a			
	BW	Body Weight	kg	70	EPA, 1991			
	AT-C	Averaging Time (Cancer)	days	25,550	EPA, 1989a			
	AT-N	Averaging Time (Non-Cancer)	days	8,760	EPA, 1989a			
Inhalation of VOCs	CA	Chemical Concentration in Air	mg/m^3	See Text	See Text			Chronic Daily Intake (CDI) (mg/kg-day) = CA x IR x ET x EF x ED x 1/BW x 1/AT
	IR	Inhalation Rate	m^3/hr	0.83	EPA, 1997a			
	ET	Exposure Time	hr/day	0.25	EPA, 1997a			
	EF	Exposure Frequency	days/year	350	EPA, 1991			
	ED	Exposure Duration	years	24	EPA, 1991			
	BW	Body Weight	kg	70	EPA, 1997a			
	AT-C	Averaging Time (Cancer)	days	25,550	EPA, 1989			
	AT-N	Averaging Time (Non-Cancer)	days	8,760	EPA, 1989			

Sources:

EPA, 1997a: Exposure Factors Handbook

EPA, 1991: Standard Default Exposure Factors

EPA, 1989: RAGS Part A

EPA 1996a: Supplemental Guidance to RAGS: Region 4 Bulletins

EPA 1992: Dermal Exposure Assessment: Principles and Applications

TABLE 15.3

VALUES USED FOR DAILY INTAKE CALCULATIONS

KIM-STAN LANDFILL

Scenario Timeframe: Future
Medium: Groundwater
Exposure Medium: Groundwater
Exposure Point: Tap Water
Receptor Population: Resident
Receptor Age: Child

Exposure Route	Parameter Code	Parameter Definition	Units	RME Value	RME Rationale/ Reference	CT Value	CT Rationale/ Reference	Intake Equation/ Model Name
Ingestion	CW	Chemical Concentration in Groundwater	mg/L	See Table 3	See Table 3			Chronic Daily Intake (CDI) (mg/kg-day) =
	IR-W	Ingestion Rate of Water	L/day	1	EPA, 1997a			CW x IR x EF x ED x 1/BW x 1/AT
	EF	Exposure Frequency	days/year	350	EPA, 1991			
	ED	Exposure Duration	years	6	EPA, 1991			
	BW	Body Weight	kg	15	EPA, 1991			
	AT-C	Averaging Time (Cancer)	days	25,550	EPA, 1989a			
	AT-N	Averaging Time (Non-Cancer)	days	2,190	EPA, 1989a			

Sources:

EPA 1997a Exposure Factors Handbook

EPA 1991 Standard Default Exposure Factors

EPA, 1989a: RAGS Part A

EPA, 1996a. Supplemental Guidance to RAGS Region 4 Bulletins

TABLE 15.4

VALUES USED FOR DAILY INTAKE CALCULATIONS

KIM-STAN LANDFILL

Scenario Timeframe Future
Medium Groundwater
Exposure Medium Groundwater
Exposure Point Tap water
Receptor Population Industrial/ Commercial Worker
Receptor Age Adult

Exposure Route	Parameter Code	Parameter Definition	Units	RME Value	RME Rationale/ Reference	CT Value	CT Rationale/ Reference	Intake Equation/ Model Name
Ingestion	CW	Chemical Concentration in Groundwater	mg/L	See Table 3	See Table 3			Chronic Daily Intake (CDI) (mg/kg-day) = CW x IR x EF x ED x 1/BW x 1/AT
	IR-W	Ingestion Rate of Water	L/day	1	EPA, 1991			
	EF	Exposure Frequency	days/year	250	EPA, 1991			
	ED	Exposure Duration	years	25	EPA, 1991			
	BW	Body Weight	kg	70	EPA, 1991			
	AT-C	Averaging Time (Cancer)	days	25,550	EPA, 1989a			
	AT-N	Averaging Time (Non-Cancer)	days	9,125	EPA, 1989a			

Sources

EPA 1997a Exposure Factors Handbook

EPA 1991 Standard Default Exposure Factors

EPA, 1989a RAGS Part A

EPA, 1996a Supplemental Guidance to RAGS Region 4 Bulletins

TABLE 16.1

NON-CANCER TOXICITY DATA -- ORAL/DERMAL

KIM-STAN LANDFILL

Chemical of Potential Concern	Chronic/ Subchronic	Oral RfD Value	Oral RfD Units	Oral to Dermal Adjustment Factor (1)	Adjusted Dermal RfD (2)	Units	Primary Target Organ	Combined Uncertainty/Modifying Factors	Sources of RfD Target Organ	Dates of RfD Target Organ (3) (MM/DD/YY)
Arsenic	Chronic	3E-04	mg/kg-day	95%	2.9E-04	mg/kg-day	Skin, Vascular System	3	IRIS	3/19/2001
Iron	Chronic	3E-01	mg/kg-day	20%	6.0E-02	mg/kg-day	Blood, Liver, GI Tract		NCEA	3/19/2001
Manganese	Chronic	2E-02	mg/kg-day	20%	4.8E-03	mg/kg-day	CNS	3	IRIS	3/19/2001
Thallium*	Chronic	8E-05	mg/kg-day	20%	1.4E-05	mg/kg-day	Blood, Liver	3000	IRIS	3/19/2001
Vinyl Chloride	Chronic	3E-03	mg/kg-day	80%	2.4E-03	mg/kg-day	Liver	30	IRIS	3/20/2001

*Value for Thallium carbonate used

N/A = Not Available

CNS = Central nervous system

IRIS = Integrated Risk Information System

HEAST = Health Effects Assessment Summary Tables

NCEA = National Center for Environmental Assessment

Other = Region III Risk-Based Concentration Table

(1) Refer to RAGS, Part A and text for an explanation

(2) Provide equation used for derivation

(3) For IRIS values, provided the date IRIS was searched

For HEAST values, provided the date of HEAST

NCEA values obtained from Region III RBC Table, dated 03/19/01

TABLE 16.2

NON-CANCER TOXICITY DATA -- INHALATION

KIM-STAN LANDFILL

Chemical of Potential Concern	Chronic/ Subchronic	Value Inhalation RfC	Units	Adjusted Inhalation RfD (1)	Units	Primary Target Organ	Combined Uncertainty/Modifying Factors	Sources of RfC RfD Target Organ	Dates (2) (MM/DD/YY)
Arsenic	Chronic	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A
Iron	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A
Manganese	Chronic	5E-05	mg/m3	1.4E-05	mg/kg-day	CNS	1,000	IRIS	3/19/2001
Thallium	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A
Vinyl Chloride	Chronic	1E-01	mg/m3	2.9E-02	mg/kg-day	Liver	30	IRIS	3/19/2001

N/A = Not Available

CNS = Central nervous system

CVS= Cardiovascular system

IRIS = Integrated Risk Information System

HEAST = Health Effects Assessment Summary Tables

NCEA = National Center for Environmental Assessment

(1) Explanation of derivation provided in text

(2) For IRIS values, provided the date IRIS was searched

For HEAST values, provided the date of HEAST.

NCEA values obtained from Region III RBC Table, dated 03/19/01

TABLE 17.1

CANCER TOXICITY DATA -- ORAL/DERMAL

KIM-STAN LANDFILL

Chemical of Potential Concern	Oral Cancer Slope Factor	Oral to Dermal Adjustment Factor	Adjusted Dermal Cancer Slope Factor (1)	Units	Weight of Evidence/ Cancer Guideline Description	Source	Date (2) (MM/DD/YY)
Arsenic	1.5E+00	95%	1.6E+00	(mg/kg-day)-1	A	IRIS	03/19/2001
Iron	N/A	N/A	N/A	N/A	N/A	N/A	03/19/2001
Lead	N/A	N/A	N/A	N/A	N/A	N/A	03/19/2001
Manganese	N/A	N/A	N/A	N/A	D	IRIS	03/19/2001
Thallium**	N/A	N/A	N/A	N/A	D	IRIS	03/19/2001
Vinyl Chloride	7.2E-01	80%	9.0E-01	(mg/kg-day)-1	A	IRIS	03/19/2001

**Value for thallium carbonate used

N/A = Not Available

IRIS = Integrated Risk Information System

HEAST= Health Effects Assessment Summary Tables

NCEA= *National Center for Environmental Assessment*

(1) Explanation of derivation provided in text.

(2) For IRIS values, provide the date IRIS was searched.
For HEAST values, provide the date of HEAST.
NCEA values obtained from Region III RBC Table, dated 04/12/99.

EPA Group:
A - Human carcinogen
B1 - Probable human carcinogen - indicates that limited human data are available
B2 - Probable human carcinogen - indicates sufficient evidence in animals and inadequate or no evidence in humans
C - Possible human carcinogen
D - Not classifiable as a human carcinogen
E - Evidence of noncarcinogenicity

Weight of Evidence:
Known/Likely
Cannot be Determined
Not Likely

TABLE 17.2

CANCER TOXICITY DATA -- INHALATION

KIM-STAN LANDFILL

Chemical of Potential Concern	Unit Risk	Units	Adjustment (1)	Inhalation Cancer Slope Factor	Units	Weight of Evidence/ Cancer Guideline Description	Source	Date (2) (MM/DD/YY)
Arsenic	4.3E-03	(ug/m3)-1	3,500	1.5E+01	(mg/kg-day)-1	A	IRIS	03/20/2001
Iron	N/A	N/A	N/A	N/A	N/A	N/A	N/A	03/20/2001
Lead	N/A	N/A	N/A	N/A	N/A	N/A	N/A	03/20/2001
Manganese	N/A	N/A	N/A	N/A	N/A	D	IRIS	03/20/2001
Thallium	N/A	N/A	N/A	N/A	N/A	D	IRIS	03/20/2001
Vinyl Chloride	4.4E-06	(ug/m3)-1	3,500	1.5E-02	(mg/kg-day)-1	A	IRIS	03/20/2001

IRIS = Integrated Risk Information System

HEAST= Health Effects Assessment Summary Tables

NCEA= National Center for Environmental Assessment

N/A=Not available

(1) Explanation of derivation provided in text

(2) For IRIS values, provide the date IRIS was searched.
For HEAST values, provide the date of HEAST.
NCEA values obtained from Region III RBC Table, dated 04/12/99.

EPA Group:

A - Human carcinogen

B1 - Probable human carcinogen - indicates that limited human data are available

B2 - Probable human carcinogen - indicates sufficient evidence in animals and inadequate or no evidence in humans

C - Possible human carcinogen

D - Not classifiable as a human carcinogen

E - Evidence of noncarcinogenicity

Weight of Evidence:

Known/Likely

Cannot be Determined

Not Likely

Table 18.1
Risk Characterization Summary - Carcinogens
Adult Resident

Scenario Timeframe:	Future								
Receptor Population:	Resident								
Receptor Age:	Adult								
				Carcinogenic Risk					
Medium	Exposure Medium	Exposure Point	Chemicals of Concern	Ingestion	Inhalation	Dermal	External (Radiation)	Exposure Routes Total	
Ground Water	Ground Water	Tap Water	vinyl chloride	1.40E-05	3.60E-07	7.80E-07	N/A	1.50E-05	
		Tap Water	arsenic	1.10E-03	--	2.90E-06	N/A	1.10E-03	
		Tap Water	iron	--	--	--	N/A		
		Tap Water	manganese	--	--	--	N/A		
		Tap Water	thallium	--	--	--	N/A		
							Ground Water Risk Total	1.10E-03	
							Total Risk	1.10E-03	

Key

-- : Toxicity criteria are not availability to quantitatively address this route of exposure.
N/A: Route of exposure is not applicable to this medium.

Risk Characterization

Table 18.1 provides risk estimates for the significant routes of exposure. These risk estimates are based on a reasonable maximum exposure and were developed by taking into account various conservative assumptions about the frequency and duration of a adult's exposure to ground water, as well as the toxicity of the COCs (vinyl chloride, arsenic, iron, manganese, and thallium). The total risk from direct exposure to contaminated ground water at this site to a future adult resident is estimated to be 1.10×10^{-3}. The COCs contributing most to this risk level are arsenic and vinyl chloride in ground water. This risk level indicates that if no clean-up action is taken, an individual would have an increased probablity of 3 in 100 of developing cancer as a result of site-related exposure to the COCs.

Table 18.2
Risk Characterization Summary - Carcinogens
Child Resident

Scenario Timeframe:		Future						
Receptor Population:		Resident						
Receptor Age:		Child						
				Carcinogenic Risk				
Medium	Exposure Medium	Exposure Point	Chemicals of Concern	Ingestion	Inhalation	Dermal	External (Radiation)	Exposure Routes Total
Ground Water	Ground Water	Tap Water	vinyl chloride	7.90E-06	3.20E-07	1.80E-07	N/A	8.40E-06
		Tap Water	arsenic	6.20E-04	--	6.70E-07	N/A	6.20E-04
		Tap Water	iron	--	--	--	N/A	
		Tap Water	manganese	--	--	--	N/A	
		Tap Water	thallium	--	--	--	N/A	
							Ground Water Risk Total	6.30E-04
							Total Risk	6.30E-04

Key

-- : Toxicity criteria are not availability to quantitatively address this route of exposure.
N/A: Route of exposure is not applicable to this medium.

Risk Characterization

Table 18.2 provides risk estimates for the significant routes of exposure. These risk estimates are based on a reasonable maximum exposure and were developed by taking into account various conservative assumptions about the frequency and duration of a child's exposure to ground water, as well as the toxicity of the COCs (vinyl chloride, arsenic, iron, manganese, and thallium). The total risk from direct exposure to contaminated ground water at this site to a future child resident is estimated to be 6.30×10^{-4}. The COCs contributing most to this risk level are arsenic and vinyl chloride in ground water.

Table 18.4
Risk Characterization Summary - Non-Carcinogens
Resident Adult

Scenario Timeframe: Future
Receptor Population: Resident
Receptor Age: Adult

Medium	Exposure Medium	Exposure Point	Chemicals of Concern	Primary Target Organ	Non-Carcinogenic Hazard Quotient			
					Ingestion	Inhalation	Dermal	Exposure Routes Total
Ground Water	Ground Water	Tap Water	vinyl chloride	Liver	1.80E-02	2.50E-03	1.00E-03	2.20E-02
		Tap Water	arsenic	Skin	6.80E+00	--	1.80E-02	6.80E+00
		Tap Water	iron	Blood	1.90E+00	--	2.30E-02	1.90E+00
		Tap Water	manganese	Central Nervous System	4.10E+00	--	4.40E-02	4.20E+00
		Tap Water	thallium	Blood	2.10E+00		3.10E-02	2.10E+00
Ground Water Hazard Index Total								15
Receptor Hazard Index								15
Blood Hazard Index								4.00E+00
Skin Hazard Index								6.8
Central Nervous System Index								4.2
Liver Hazard Index								2.20E-02

Key

--- : Toxicity criteria are not availability to quantitatively address this route of exposure.
N/A: Route of exposure is not applicable to this medium.

Risk Characterization

Table 18.4 provides hazard quotients (HQs) for each route of exposure and the hazard index (sum of hazard quotients) for all routes of exposure. The Risk Assessment Guidance (RAGS) for Superfund states that, generally, a hazard index (HI) greater than 1 indicates the potential for adverse noncancer effects. The estimated HI of 15 indicates that the potential for adverse noncancer effects could occur from exposure to contaminated ground water containing vinyl chloride, arsenic, iron, manganese, and thallium.

Table 18.5
Risk Characterization Summary - Non-Carcinogens
Resident Child

Scenario Timeframe:		Future						
Receptor Population:		Resident						
Receptor Age:		Child						
					Non-Carcinogenic Hazard Quotient			
Medium	Exposure Medium	Exposure Point	Chemicals of Concern	Primary Target Organ	Ingestion	Inhalation	Dermal	Exposure Routes Total
Ground Water	Ground Water	Tap Water	vinyl chloride	Liver	4.30E-02	8.60E-03	1.00E-03	5.20E-02
		Tap Water	arsenic	Skin	1.60E+01	--	1.70E-02	1.60E+01
		Tap Water	iron	Blood	4.50E+00	--	2.20E-02	6.90E-01
		Tap Water	manganese	Central Nervous System	9.80E+00	--	4.20E-02	9.80E+00
		Tap Water	thallium	Blood	5.00E+00		2.90E+02	5.00E+00
							Ground Water Hazard Index Total	31.5
							Receptor Hazard Index	31.5
							Blood Hazard Index	5.7
							Skin Hazard Index	16
							Central Nervous System Index	9.8
							Liver Hazard Index	5.20E-02

Key

--- : Toxicity criteria are not availability to quantitatively address this route of exposure.
N/A: Route of exposure is not applicable to this medium.

Risk Characterization

Table 18.5 provides hazard quotients (HQs) for each route of exposure and the hazard index (sum of hazard quotients) for all routes of exposure. The Risk Assessment Guidance (RAGS) for Superfund states that, generally, a hazard index (HI) greater than 1 indicates the potential for adverse noncancer effects. The estimated HI of 31.5 indicates that the potential for adverse noncancer effects could occur from exposure to contaminated ground water containing vinyl chloride, arsenic, iron, manganese, and thallium.

Table 18.6
Risk Characterization Summary - Non-Carcinogens
Industrial Worker

Scenario Timeframe: Future
Receptor Population: Industrial Worker
Receptor Age: Adult

Medium	Exposure Medium	Exposure Point	Chemicals of Concern	Primary Target Organ	Non-Carcinogenic Hazard Quotient			
					Ingestion	Inhalation	Dermal	Exposure Routes Total
Ground Water	Ground Water	Tap Water	vinyl chloride	Liver	6.50E-03	--	--	6.50E-03
		Tap Water	arsenic	Skin	2.50E+00	--	--	2.50E+00
		Tap Water	iron	Blood	6.90E-01	--	--	6.90E-01
		Tap Water	manganese	Central Nervous System	1.50E+00	--	--	1.50E+00
		Tap Water	thallium	Blood	7.60E-01			7.60E-01
							Ground Water Hazard Index Total	5.45
							Receptor Hazard Index	5.45
							Blood Hazard Index	1.45
							Skin Hazard Index	2.5
							Central Nervous System Index	1.5
							Liver Hazard Index	6.50E-03

Key

--- : Toxicity criteria are not availability to quantitatively address this route of exposure.
N/A: Route of exposure is not applicable to this medium.

Risk Characterization

Table 18.6 provides hazard quotients (HQs) for each route of exposure and the hazard index (sum of hazard quotients) for all routes of exposure. The Risk Assessment Guidance (RAGS) for Superfund states that, generally, a hazard index (HI) greater than 1 indicates the potential for adverse noncancer effects. The estimated HI of 5.45 indicates that the potential for adverse noncancer effects could occur from exposure to contaminated ground water containing vinyl chloride, arsenic, iron, manganese, and thallium.

Table 19
Cost Estimate Summary for the Selected Remedy

Preferred Alternative - Capital Cost

Description	Quantity	Unit	Unit Cost	Cost
A. Multi-Layer Cap Construction				
1. Mobilization/Demobilization	---	LS	---	$35,000
2. Multi-Layer Cap Construction				
Sediment & Erosion Controls	---	LS	—	$50,000
Clearing/Grubbing	24	acre	$1,500.00	$36,000
UST Removal & Underground line/MH Abandonment	---	LS	---	$30,000
General Site Regrading (cap subgrade, SW swales & basins)	7,000	CY	$4.00	$28,000
Subgrade Densification	24	Acre	$1,000.00	$24,000
Bedding Layer Installation	4,000	CY	$20.00	$80,000
Geocomposite Gas Venting Layer	116,160	SY	$4.05	$470,448
40 mil LDPE Geomembrane	116,160	SY	$3.80	$441,408
Geocomposite Drainage Layer	116,160	SY	$4.05	$470,448
Cover Soil Layer (18" thick over 24 acres)	58,080	CY	$20.00	$1,161,600
Settlement Monitors	8	EA	$750.00	$6,000
Topsoil Installation (6-inch thickness)	24	Acre	$16,100.00	$386,400
Vegetative Cover (Seeding/Mulch)	24	Acre	$4,500.00	$108,000
3. Gas Management System				
Subcontractor Mob/Demob	—	LS	—	$3,000
Gas Monitoring Wells (Total 7, 20' deep)	140	LF	$50.00	$7,000
Gas Monitoring Wells Stick-up Assembly	7	EA	$500.00	$3,500
Gas Vents (45 Total: 37 subsurface, 8 w/risers)	1,914	LF	$60.00	$114,840
Gas Vent Riser Assembly w/turbine ventilators	8	EA	$650.00	$5,200
4. Security Fencing/Gates				
8' Foot Chain-Link-Fence (around 8 individual vents)	960	LF	$27.00	$25,920
B. Collector Trench/Barrier Wall Installation, Pump and Treat with Discharge to Low Moor WWTP				
1. Mobilization/Demobilization	1	LS	$25,000	$50,000
2. Forcemain From KSL to Gravity Sewer Connection				
Force Main (2-inch)	7600	EA	$40	$304,000
New Duplex Pump Stations	2	EA	$20,000	$40,000
3. Gravity Sewer Improvements				
Gravity sanitary sewer, 12" PVC	2400	LF	$50	$120,000
Gravity sanitary sewer, 15" PVC	1000	LF	$65	$65,000
Manholes w. F&C	16	EA	$2,000	$32,000
E&S Control	1	LS	$20,000	$20,000
Drainage and pavement	1	LS	$10,000	$10,000
4. Upgrades to Low Moor WWTP				
New sequencing batch reactor (50 ft. diameter, 20 ft. high, bolted glass-fused steel tank with access platform, influent and effluent piping, air piping, access road, misc. drainage, fence and E&S).	—	LS	—	$400,000
5. Leachate Collector Trench/Barrier Wall (Bio-Polymer Trenching)				
Subcontractor Mob./Demob.	—	LS	—	$133,000
Collector trench installation	24,950	SF	$7.75	$193,363
Geotextile envelope	1,250	LF	$14.50	$18,125
Wet well installation	2	EA	$7,500.00	$15,000
HDPE liner	24,950	SF	$3.50	$87,325
Compatibility & treatability testing	1	LS	$18,000.00	$18,000
C. Off-Site Groundwater Monitoring				
1. Signs	1	LS	$500	$500
2. Deed Restrictions	1	LS	$15,000	$15,000
Subtotal				**$5,008,077**
Contingency On Construction Capital Costs (25%)				$1,586,019
Remedial Design and Construction Management (15%)				$751,211
Total Capital Cost				**$7,345,000**

Table 19 (continued)
Cost Estimate Summary for the Selected Remedy

Preferred Alternative - Annual Operation and Maintenance Costs

Description	Quantity	Unit	Unit Cost	Cost
A. Multi-Layer Cap O&M				
1. Years 1 through 5				
Visual Inspections (Quarterly)	---	LS	---	$6,000
Gas Monitoring Well & Gas Vent Monitoring (Quarterly)	---	LS	---	$9,000
Mowing (Semi-annually)	---	LS	---	$6,000
Site Maintenance, (Revegetation, cover repair, settlement, sed. Removal, etc.)	---	LS	---	$25,000
Subtotal Annual O&M Costs, Years 1-5				**$46,000**
2. Years 6 through 30				
Visual Inspections (Quarterly)	---	LS	---	$6,000
Gas Monitoring Well & Gas Vent Monitoring (Annually)	---	LS	---	$2,250
Mowing (Semi-annually)	---	LS	---	$6,000
Site Maintenance, (Revegetation, cover repair, settlement, sed. Removal, etc.)	---	LS	---	$15,000
Subtotal Annual O&M Costs, Years 6-30				**$29,250**
B. Pump and Treat with Discharge to Low Moor WWTP				
1. Wastewater disposal fee for discharge to the LMWWTP	3,285	1000-gal	$4.5	$14,783
Subtotal Annual O&M Cost				**$14,783**
C. Off-Site Groundwater Monitoring				
1. Groundwater/Leachate Monitoring - Quarterly Sampling	76	Year	$2,000	**$152,000**
Total Annual O&M Cost (1-5 Years)				**$212,783**
Total Annual O&M Cost (6-30 Years)				**$196,033**

Table 19 *(continued)*
Cost Estimate Summary for the Selected Remedy

Preferred Alternative - Summary of Present Worth Analysis

Year	Capital Cost	Multi-Layer Cap	Pump & Treat (LMWWTP)	Off-site Groundwater Monitoring	Annual O&M Cost	Total Cost	Discount Factor (7%)	Present Worth
0	$7,345,000				$0	$7,345,000	1.000	$7,345,000
1		$46,000	$14,783	$152,000	$212,783	$212,783	0.935	$198,862
2		$46,000	$14,783	$152,000	$212,783	$212,783	0.873	$185,852
3		$46,000	$14,783	$152,000	$212,783	$212,783	0.816	$173,694
4		$46,000	$14,783	$152,000	$212,783	$212,783	0.763	$162,331
5		$46,000	$14,783	$152,000	$212,783	$212,783	0.713	$151,711
6		$29,250	$14,783	$152,000	$196,033	$196,033	0.666	$130,625
7		$29,250	$14,783	$152,000	$196,033	$196,033	0.623	$122,079
8		$29,250	$14,783	$152,000	$196,033	$196,033	0.582	$114,093
9		$29,250	$14,783	$152,000	$196,033	$196,033	0.544	$106,629
10		$29,250	$14,783	$152,000	$196,033	$196,033	0.508	$99,653
11		$29,250	$14,783	$152,000	$196,033	$196,033	0.475	$93,134
12		$29,250	$14,783	$152,000	$196,033	$196,033	0.444	$87,041
13		$29,250	$14,783	$152,000	$196,033	$196,033	0.415	$81,347
14		$29,250	$14,783	$152,000	$196,033	$196,033	0.388	$76,025
15		$29,250	$14,783	$152,000	$196,033	$196,033	0.362	$71,051
16		$29,250	$14,783	$152,000	$196,033	$196,033	0.339	$66,403
17		$29,250	$14,783	$152,000	$196,033	$196,033	0.317	$62,059
18		$29,250	$14,783	$152,000	$196,033	$196,033	0.296	$57,999
19		$29,250	$14,783	$152,000	$196,033	$196,033	0.277	$54,205
20		$29,250	$14,783	$152,000	$196,033	$196,033	0.258	$50,659
21		$29,250	$14,783	$152,000	$196,033	$196,033	0.242	$47,344
22		$29,250	$14,783	$152,000	$196,033	$196,033	0.226	$44,247
23		$29,250	$14,783	$152,000	$196,033	$196,033	0.211	$41,352
24		$29,250	$14,783	$152,000	$196,033	$196,033	0.197	$38,647
25		$29,250	$14,783	$152,000	$196,033	$196,033	0.184	$36,119
26		$29,250	$14,783	$152,000	$196,033	$196,033	0.172	$33,756
27		$29,250	$14,783	$152,000	$196,033	$196,033	0.161	$31,548
28		$29,250	$14,783	$152,000	$196,033	$196,033	0.150	$29,484
29		$29,250	$14,783	$152,000	$196,033	$196,033	0.141	$27,555
30		$29,250	$14,783	$152,000	$196,033	$196,033	0.131	$25,752
TOTAL	**$7,345,000**				**$5,965,000**	**$13,310,000**		**$9,847,000**

Total Present Worth Cost **$9,847,000**

Notes

LS = Lump Sum; EA = Each; SF = Square Foot; LF = Leniar Foot
Cost Estimates are within +50% to -30% accurace expectation.
Cost estimate based on EPA Manual EPA 540-R-00-002 guidance document.
Telephonic quotes were obtained from most vendors.
O&M Costs are reported as present worth estimates given a 7% discount rate for a 30 year duraion.
Wells MW03, MW04, MW05, MW06, MW07, MW08, MW09, MW10S, MW10D, MW11S, MW11D, LW03S, LW03D, LW08S, LW08D, LW01, LW02, LS05, LS03 will be sampled on a quarterly

Table 19 (continued)
Cost Estimate Summary for the Selected Remedy

Preferred Alternative - Summary of Present Worth Analysis

Year	Capital Cost	Multi-Layer Cap	Pump & Treat (LMWWTP)	Off-site Groundwater Monitoring	Annual O&M Cost	Total Cost	Discount Factor (7%)	Present Worth
0	$7,345,000				$0	$7,345,000	1.000	$7,345,000
1		$46,000	$14,783	$152,000	$212,783	$212,783	0.935	$198,862
2		$46,000	$14,783	$152,000	$212,783	$212,783	0.873	$185,852
3		$46,000	$14,783	$152,000	$212,783	$212,783	0.816	$173,694
4		$46,000	$14,783	$152,000	$212,783	$212,783	0.763	$162,331
5		$46,000	$14,783	$152,000	$212,783	$212,783	0.713	$151,711
6		$29,250	$14,783	$152,000	$196,033	$196,033	0.666	$130,625
7		$29,250	$14,783	$152,000	$196,033	$196,033	0.623	$122,079
8		$29,250	$14,783	$152,000	$196,033	$196,033	0.582	$114,093
9		$29,250	$14,783	$152,000	$196,033	$196,033	0.544	$106,629
10		$29,250	$14,783	$152,000	$196,033	$196,033	0.508	$99,653
11		$29,250	$14,783	$152,000	$196,033	$196,033	0.475	$93,134
12		$29,250	$14,783	$152,000	$196,033	$196,033	0.444	$87,041
13		$29,250	$14,783	$152,000	$196,033	$196,033	0.415	$81,347
14		$29,250	$14,783	$152,000	$196,033	$196,033	0.388	$76,025
15		$29,250	$14,783	$152,000	$196,033	$196,033	0.362	$71,051
16		$29,250	$14,783	$152,000	$196,033	$196,033	0.339	$66,403
17		$29,250	$14,783	$152,000	$196,033	$196,033	0.317	$62,059
18		$29,250	$14,783	$152,000	$196,033	$196,033	0.296	$57,999
19		$29,250	$14,783	$152,000	$196,033	$196,033	0.277	$54,205
20		$29,250	$14,783	$152,000	$196,033	$196,033	0.258	$50,659
21		$29,250	$14,783	$152,000	$196,033	$196,033	0.242	$47,344
22		$29,250	$14,783	$152,000	$196,033	$196,033	0.226	$44,247
23		$29,250	$14,783	$152,000	$196,033	$196,033	0.211	$41,352
24		$29,250	$14,783	$152,000	$196,033	$196,033	0.197	$38,647
25		$29,250	$14,783	$152,000	$196,033	$196,033	0.184	$36,119
26		$29,250	$14,783	$152,000	$196,033	$196,033	0.172	$33,756
27		$29,250	$14,783	$152,000	$196,033	$196,033	0.161	$31,548
28		$29,250	$14,783	$152,000	$196,033	$196,033	0.150	$29,484
29		$29,250	$14,783	$152,000	$196,033	$196,033	0.141	$27,555
30		$29,250	$14,783	$152,000	$196,033	$196,033	0.131	$25,752
TOTAL	**$7,345,000**				**$5,965,000**	**$13,310,000**		**$9,847,000**

Total Present Worth Cost **$9,847,000**

Notes

LS = Lump Sum; EA = Each; SF = Square Foot; LF = Leniar Foot
Cost Estimates are within +50% to -30% accurace expectation.
Cost estimate based on EPA Manual EPA 540-R-00-002 guidance document.
Telephonic quotes were obtained from most vendors.
O&M Costs are reported as present worth estimates given a 7% discount rate for a 30 year duraion.
Wells MW03, MW04, MW05, MW06, MW07, MW08, MW09, MW10S, MW10D, MW11S, MW11D, LW03S, LW03D, LW08S, LW08D, LW01, LW02, LS05, LS03 will be sampled on a quarterly basis for monitoring

Table 20 Human Health Risks at the Site		
Risk From Exposure To Channel Sediment	**Cancer Risk**	**Hazard Index**
Current/Future Child Resident	6.4E-5	5
Current/Future Adult Resident	2.5E-5	0.8
Future Industrial/Commercial Worker	8.9E-6	0.3
Trespasser	3.8E-6	0.15
Risk From Exposure To Floodplain Sediment	**Cancer Risk**	**Hazard Index**
Current/Future Child Resident	3.9E-5	3
Current/Future Adult Resident	1.3E-5	0.4
Future Industrial/Commercial Worker	4.9E-6	0.16
Trespasser	1.7E-6	0.08
Risk From Exposure To Surface Water	**Cancer Risk**	**Hazard Index**
Current/Future Child Resident	0	0.1
Current/Future Adult Resident	0	0.04
Future Industrial/Commercial Worker	0	0.04
Trespasser	0	0.03
Risk From Exposure To Leachate	**Cancer Risk**	**Hazard Index**
Current/Future Child Resident	9.3E-7	0.4
Current/Future Adult Resident	3E-7	0.1
Future Industrial/Commercial Worker	1.1E-6	0.1
Trespasser	3.5E-7	0.1
Risk From Exposure To Ground Water	**Cancer Risk**	**Hazard Index**
Current/Future Child Resident	6.3E-4	36
Current/Future Adult Resident	1.1E-3	15
Future Industrial/Commercial Worker	4E-4	5
Trespasser	0	0

TABLE 21
ARARs FOR KIM-STAN LANDFILL SELECTED REMEDY

ARAR OR TBC	LEGAL CITATION	CLASSIFICATION	SUMMARY OF REQUIREMENT	FURTHER SPECIFICATION AND/OR DETAILS REGARDING ARARs IN THE CONTEXT OF REMEDIATION
Safe Drinking Water Act: Maximum Contaminant Levels and Maximum Contaminant Level Goals	42 U.S.C. § 300(f); 40 C.F.R. §§ 141.11-16; 40 C.F. R. §§ 141.50-52	Relevant and Appropriate	MCLGs are non-enforceable health-based drinking water goals established at levels at which no known or anticipated adverse health effects will occur and which allow for an adequate margin of safety.	EPA regulation establishes that, where relevant and appropriate, MCLGs set at levels above zero will be attained at CERCLA sites and that, where the MCLG is set at zero, the MCL will be attained.
Virginia Waterworks Regulation	12 VAC 5-590-440, Tables 2.2 and 2.3	Relevant and Appropriate	MCLs are enforceable drinking water standards applied to specific contaminants which EPA has determined have an adverse effect on human health above certain levels.	The more stringent of the Federal or State MCLGs/MCLs for antimony, arsenic, barium, nickel, thallium, and vinyl chloride will be attained.

Virginia Anti-Degradation Policy for Groundwater	9 VAC 25-260-200, 210	Applicable	Requires that if the concentration of any constituent in groundwater is less than the limit set forth in Virginia's groundwater standards, the "natural quality" for the constituent shall be maintained. Further requires that "natural quality" shall be maintained for constituents for which Virginia has not set standards. Variances are permissible under certain circumstances.	If read to require immediate compliance, then EPA invokes an interim waiver under Section 121(d)(4)(A) of CERCLA, because "the remedial action selected is only part of a total remedial action that will attain such level or standard of control when completed." The remedial action *will attain the standards set* by this regulation at completion of the remedial action, with respect to constituents for which Virginia groundwater standards exist (arsenic and barium). With respect to each contaminant of concern for which no Virginia groundwater standard exists (antimony, nickel, thallium, and vinyl chloride), the remedial action will attain "natural quality," provided that this level is above detection level and attaining such level is not technologically impracticable.
Resource Conservation and Recovery Act: Criteria for Municipal Solid Waste Landfills			These are standards for groundwater monitoring and corrective action, closure, and post-closure care for solid waste landfills.	The more stringent of the Federal and State substantive requirements will be attained.
Groundwater Monitoring and Corrective Action	40 C.F.R. Part 258, Subpart E	Applicable		
Closure and Post-Closure Care	40 C.F.R. Part 258, Subpart F	Applicable		

Virginia Solid Waste Management Regulations: Sanitary Landfills			These are standards for groundwater monitoring and corrective action, closure, and post-closure care for sanitary landfills.	
Groundwater Monitoring	9 VAC 20-80-250(D)	Applicable		
Closure	9 VAC 20-80-250(E)	Applicable		
Post Closure	9 VAC 20-80-250(F)	Applicable		
Control of Decomposition of Gases	9 VAC 20-80-280	Applicable		
Leachate Control System and Monitoring	9 VAC 20-80-290	Applicable		
Corrective Action	9 VAC 20-80-310	Applicable		
Virginia Erosion and Sediment Control Regulations	4 VAC 50-30-10 to 110	Applicable		The substantive requirements of these regulations will be attained. No permits are required.
Virginia Stormwater Management Regulations	4 VAC 3-20-10; 60(A)-(G), (J)-(L); 71; 81(A); and 85(A), (B), and (D).	Applicable	These regulations establish criteria for management of storm water within the Commonwealth.	The substantive requirements of these regulations will be attained. No permits are required.
Virginia Ambient Air Quality Standards: Control of Particulate Matter	9 VAC 5-30-60	Applicable	These regulations establish standards for particulate matter in ambient air.	The substantive requirements of these regulations *will be attained during* construction activities. No permits are required.
Virginia Regulations: New and Modified Stationary Sources: Visible and Fugitive Dust Emissions	9 VAC 5-50-20; 60 to 120	Applicable	These regulations establish standards for visible and fugitive dust emissions from new/modified stationary sources.	The substantive requirements of these regulations will be attained during construction activities. No permits are required.

Executive Order 11990 (Protection of Wetlands); procedures on Floodplain Management and Wetlands Protection	40 C.F.R. Part 6, Appendix A	Applicable	These regulations establish standards for determining the extent of mitigation where wetlands are impacted	The substantive requirements of these regulations will be attained. No permits are required
Virginia Wetlands Mitigation Compensation Policy	9 VAC 25-210-10 to 50	Applicable		